

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. February, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 17TH, 1877.—A stated meeting was held at 8 o'clock P. M.

Communications* from Messrs. Charles W. Copeland and Francis Collingwood, giving account of the "Mount Washington Railway, (N. H.), its construction and operation," were read and discussed. A photograph of a portion of the railway, showing the center rail and the style of locomotive engine used, was exhibited.

It was announced that the American Institute of Mining Engineers would hold a general (quarterly) meeting in this city, beginning Tuesday, February 27th, next,† and the Institute was invited to meet at the rooms of the Society.

"Facts and Opinions in regard to Failure of the Railway Bridge at Ashtabula, Ohio," were then considered. Extracts relating to the matter, from newspapers and other sources, with illustrations of the structure and its site were presented.

Mr. Charles Macdonald, who had examined the wreck, soon after its failure, described the plan of the bridge, and its appearance after the disaster; a general discussion followed.

FEBRUARY 7TH, 1877.—A regular meeting was held at 8 o'clock P. M.

The vote on admission to membership was canvassed and the following declared elected:—Members—Frederick S. Benson of Brooklyn, N. Y.; Eckley B. Coxe of Drifton, Pa.; William C. Gunnell of Hartford, Conn., and David E. McComb of Washington, D. C.; and Junior, Sanford Horton of New York.

At the same time, the vote ordered December 6th, 1876 ‡ (under resolution presented at the Eighth Annual Convention §), upon appointment of a Committee to report to the Society, a form of Memorial to Congress in furtherance of the adoption of a metric standard, was canvassed, with the following result—ayes 138, nays 73, and blank 20.

* See page 12. † See page 18. ‡ Vol. II, page 173. § Vol. II, page 85.

A paper by Henry F. Walling, C. E., of Boston, Mass., on "Co-ordinate Surveying" was read; also—as relating to the same subject—extracts from a recent report upon the "New York State Survey."

Attention was called to the next meeting of the American Institute of Mining Engineers; the first session to be held at the Society's Rooms Tuesday evening, February 27th; a session also to be held Wednesday evening following, when an informal discussion will be had on the "advisability and practicability of adopting, in this country, the metric system of weights and measures"; members were invited to attend.

"Facts and Opinions, in regard to Failure of the Railway Bridge at Ashtabula, Ohio," were taken up. Communications from Messrs. G. K. Warren, E. N. Beebout and E. S. Philbrick, were read, and the subject was further discussed by Messrs. William P. Shinn, George S. Morison, and others present.

OF THE BOARD OF DIRECTION.

FEBRUARY 7TH, 1877.—A stated meeting was held at 3 o'clock P. M.

The manner of keeping the accounts of the Society and appropriating its funds, was considered and a plan adopted; the stated meetings were placed under the direction of the President, Secretary and Committee on Library, to arrange papers, reports and other subjects for consideration, the order of business and to give special invitations to attend; recommendations from the Committee on Library, regarding copyright, and title of the Society's monthly publications and the publication of reports, were presented and acted on; the Treasurer's report of receipts and expenditures for quarter ending January 31st, was accepted, appropriations were made, and other business transacted.

FEBRUARY 9TH, 1877.—An adjourned meeting was held at 10 o'clock A. M. Proposals for admission to membership were considered.

REPORT OF COMMITTEE

ON FINANCE, FOR YEAR ENDING OCT. 31ST, 1876.

ACCEPTED JANUARY 3d, 1877.

We have carefully examined the Treasurer's accounts of receipts and expenditures, and compared them with entries and vouchers, and find them correct. We have also examined the securities of the Society in the hands of the Treasurer, deposited for safety in the vault of the Central Safe Deposit Company, (corner of Twenty-third street and Sixth avenue). These securities are as follows:

1 Bank-book, Seaman's Savings	
Bank for Savings (balance*) \$764 17
1 \$1 000 bond, Norman Medal Fund	1 000 00
8 \$1 000 bonds, Fellowship Fund...	8 000 00
1 \$500 bond, " " " " " "	500 00
Making a total † of.....	
\$10 264 17	

* July 1st, 1876. † See detail report of sub-committee.

Some modification of the system of disbursing the Society's funds seems desirable. It has been suggested that at intervals through the year, the Finance Committee, after ascertaining the balance at the time on hand, should designate the amounts applicable to the ordinary expenses and the sum that could be devoted to increase of the Library, etc.; but, on account of the irregularity in the periods and amounts of the payments from members, etc., this is not as feasible as it might at first view appear to be. Thus, during November and December, 1875, and January, 1876, \$1 613.46, or about 45 per cent. of the total for the year, were received. In the month of October, 1875, only \$295 came in; while in the next month, November, \$1 921.10 were received; whereas in November, 1876, only \$412.50 were received (or \$1,500 less than in the same month of 1875), while in the first 20 days of December, 1876, the receipts were \$2 437.43. The mere fact of a balance in the treasury at any given date, will not of itself, afford sufficient data upon which to base the disposition of the several expenditures; an analysis of the items of receipts and expenditures will be necessary to determine how much might fairly be appropriated for expenses, beyond the ordinary annual expenditures.

In 1876, the leading items of expenses were:

Secretary and clerks.....	\$3 000 00
Transactions.....	2 613 00
Rent, fuel and light.....	1 884 00
Stationery and printing.....	\$537
Postage.....	260
	<u>797 00</u>
Reporting Proceedings.....	369 00
Total.....	<u>\$8 663 00</u>

These cover about 95 per cent. of all expenses for the fiscal year ending October 31st, 1876.

The leading receipts for the same year came from the following sources:

Entrance fees.....	\$1 670 00
Members' annual dues.....	7 014 00
Annual interest of funds.....	630 00
Advertisements.....	597 00
	<u>\$9 911 00</u>

The total amount received was \$10 433.39 (including balance, \$281.75, at end of the previous year, and \$150 Fellowship subscription).

At the end of the fiscal year of 1876, there was an apparent balance of \$1 274.77; but a few days after the close of the fiscal year, a number of bills which had to be paid, amounting to some hundreds of dollars, came in.

It may be, we think, safely assumed, that the receipts for the present fiscal year will at least equal those of last year; so that if the receipts should be, in round numbers \$10 000, and the usual expenses, say \$9 000, there would be between \$1 500 and \$2 000 (including the actual available balance from 1876), applicable to the Library, or such other purposes as the Society might deem proper.

It may be worth considering, whether or not it is advisable to create and maintain a reserve fund, to aid in securing more commodious, permanent quarters.

For convenient reference, we have summed up the receipts in 1875, during each month, as follows:

November, 1875*	\$1 921 10
December, "	1 234 37
January, 1876	1 457 99
February, "	725 80
March, "	690 55
April, "	799 57
May, "	490 03
June, "	547 50
July, "	567 10
August, "	1 107 50
September, "	596 88
October, "	295 00

Total, \$10 433 39

In the spring the balance on hand is heaviest, as the monthly expenditures are more equally divided throughout the year than are the monthly receipts.

With the foregoing statement before them, the Board of Direction can judge (as well as can the Library and Finance Committees) approximately, respecting the disposition of the Society's funds for the present fiscal year. An average of about \$760 per month was expended during the fiscal year of 1876.

We regard it as a fitting time to establish a system, which can be conveniently carried out, regulating appropriations to be made by the Board of Direction.

W. MILNOR ROBERTS. } Members
W. H. PAINE, } Finance Com.

* Including \$281.75 balance from preceding year.

STATEMENT OF THE FINANCES OF THE SOCIETY,

PREPARED FROM THE TREASURER'S REPORTS.*

RECEIPTS, 1875-6.

Past Dues from 7 resident Members.....	\$295 00	
“ 17 non-resident “	325 00	
“ 1 “ Associate	10 00	
		\$630 00
Current Dues from 79 resident Members.....	\$1 975 00	
“ 3 “ Associates.....		
“ 8 “ Juniors.....		
“ 233 non-resident Members..		3 660 00
“ 11 “ Associates.....		
“ 30 “ Juniors.....		410 00
“ 1 “ Member, balance		10 55
“ 1 resident Associate, “		5 00
		\$6 060 55
Half Dues from 3 resident Members.....	37 50	
“ 3 “ Juniors	20 00	
“ 24 non-resident Members.....	180 00	
“ 9 “ Juniors.....	45 00	
		282 50
Additional Dues from 2 Associates, and 2 Juniors, who became Members.....		20 00
Dues for 1876-7 from 1 non-resident Member.		15 00
Sundry overpayments of Dues.....		7 09
Entrance Fees from 43 Members.....	1 290 00	
“ 1 Associate.....		
“ 18 Juniors		380 00
		1 670 00
“ 1 Fellow.....		150 00
		8 835 14
Fellowship Fund. Interest on 8 Jersey City Water Loan Bonds, for year ending July 1st, 1876.....	560 00	
Norman Medal Fund. Interest on New York City Croton Aqueduct Bond, for year ending November 1st, 1875.....	70 00	
		630 00
Advertisements in Journal	597 00	
Publications.....	76 00	
Diplomas.....	13 50	
		686 50
Treasurer's Receipts for year ending October 31st, 1876.....		\$10 151 64
“ Balance, November 1st, 1875....	\$275 63	
“ “ of Fellowship Fund	6 12	
		281 75
Total.....		\$10 433 39

* Under direction of the Committee on Finance, in compliance with resolution adopted at meeting of the Society, January 3d. Approved by the Board of Direction, February 7th.

PAYMENTS, 1875-6.

Publications. Printing Journal of the Society.	\$2 322 25	
Engraving.....	265 50	
Copyright.....	5 00	
	<hr/>	\$2 592 75
Extra Papers.....		21 00
List of Members.....		94 75
	<hr/>	\$2 708 50
Reporting at Seventh and Eighth Annual Con-		
ventions.....		415 78
Stationery. Ballot Lists.....	\$30 50	
Circulars.....	85 25	
Forms of Application, Bills,		
Cards, &c.....	30 25	
Notices of Meetings and other		
Notices.....	47 25	
	<hr/>	\$193 25
Blank Books, Envelopes, Paper,		
&c.....		225 42
	<hr/>	418 67
Postage.....		260 61
Library. Books, Binding and Cards.....		62 45
Rooms. Rent.....	\$1 600 00	
Heating.....	100 00	
Gas.....	16 45	
Janitor.....	168 00	
Ice.....	4 28	
	<hr/>	1 888 73
Furnishing.....		98 82
Insurance.....		54 01
Secretary and Clerks.....		3 000 00
Norman Medal, Engraving and Case.....		74 65
Safe Deposit, Rent.....		12 00
Hand Stamps for Treasurer.....		5 50
Expressage and Sundries.....		88 90
Miscellaneous.....		5 00
	<hr/>	\$9 093 62
In Secretary's hands for Office Expenses.....		65 00
	<hr/>	
Treasurer's Payments for year ending October 31st, 1876.....		\$9 158 62
" Balance, November 1st, 1876.....		1 274 77
	<hr/>	

ASSETS AND RESOURCES, NOVEMBER 1ST, 1876.

Furniture, Library and Transactions on hand, (Secretary's estimate).	\$9 000 00	
McAlpine Library (insured for).....	2 000 00	
	<hr/>	\$11 000 00
Fellowship Fund: 8 Jersey City Water Loan (7%) Bonds, } par value \$8 000—cost.....	\$8 250 00	
Accrued Interest, from July 1st.....	186 67	
1 U. S. Registered (5-20, 6% gold) } Bond, par value \$500—cost.....	579 38	
Accrued Interest from November 1st, } 1875, \$30 Gold—say.....	31 50	
	<hr/>	9 047 55

\$10 433 39
ion adopted
ary 7th.

Brought over.....		\$9 047 55	\$11 000 00
Norman Medal Fund : 1 New York Croton Aqueduct			
(7%) Bond.....	\$1 000 00		
Accrued Interest from May 1st,			
1876	35 00		
		1 035 00	
Deposit in Seaman's Savings Bank for Savings, (January			
1st, 1877.....		821 28	
New York Central Railroad Stock : 5 shares—cost.....		536 25	
Treasurer's Balance, November 1st, 1876.....	\$1 274 77		
In Secretary's hands for office expenses.....	65 00		
		1 339 77	
Members' past dues.....		\$2 945 00	\$12 779 85
“ current dues (payable to November 1st).....		8 115 00	
			\$11 060 00
Total.....			\$34 839 85

The value of dies for the Norman Medal, and dividends on the New York Central Railroad stock accrued, since April 2d, 1868, are not included.

RECEIPTS AND PAYMENTS FOR QUARTER ENDING JANUARY 31st, 1877.

	RECEIPTS.	PAYMENTS.	
In November	\$412 50	\$1 131 48	
“ December	2 453 24	634 91	
“ January	1 602 62	262 00	
	\$4 468 36	\$2 028 39	
Excess of Receipts.....			\$2 439 97
Balance at Beginning of Quarter.....			1 274 97
Balance at end of Quarter.....			\$3 714 94

NOTES AND MEMORANDA.

SELECTIONS FROM CORRESPONDENCE.

MOUNT WASHINGTON RAILWAY.—During the past season, the Secretary, at request of foreign engineers, sought information in regard to the construction and operation of this railway.

MR. CHARLES W. COPELAND wrote: The length of this railway is about 3 miles; the total rise from the lower station to Mount Washington House, on the summit is 3 625 feet; and the steepest grade is 1 980 feet to the mile, about 1 in 3, but averaging through the entire course, 1 in 4.

The road bed is constructed with special reference to safety and durability, of heavy timber, clamped to the rocks of the mountain slope, and braced and secured in the strongest manner.

The track is of the usual gauge, with side rails of the usual pattern, and a central safety rail, constructed of two parallel bars of angle iron,

with cross bolts of 1½ inch-round iron, at intervals of about 4 inches; between these bolts play the cogs of a central wheel of the locomotive.

In addition to ordinary brakes, the atmospheric brakes, instantaneous in their action, are in use, and, following and dropping into the notch rim of the driving-wheel, is a firm iron support which would effectually prevent the descent of a train in case of injury to the machinery. Rollers under the angle iron prevent jumping or slipping from the track.

With these arrangements for safety, the passenger need feel no alarm or apprehension of danger, the trip being as safe as ordinary rail transit, no accident having occurred in the seven years the road has been in operation, nor damage of a penny to life, limb, or material, during the time of construction, or since its operation as a line of travel.

The locomotive is of novel construction, being made with special reference to the steep inclination of the road, and when standing upon the level track, appears sadly out of balance. Safety and power are attained in the construction, at the expense of speed which is not sought. The locomotive is always below the train, pushing the coach upward as it ascends, and preceding it in the return down the slope. The cars have seats hung at an angle, facing toward the base.

Mr. Copeland also submits these notes ; The road was built at first with strap rails, but as they were continually breaking, they were taken up, and a T rail weighing 30 pounds to the yard, put down instead. The centre or cog rail is made of 3 inch-angle iron, with pins made of the best Pembroke iron, 4 inches long, $1\frac{1}{2}$ inches in diameter, and 4 inches apart, riveted between them. This cog rail is nothing but an iron ladder bolted to the road bed, into which a gear wheel on the driving axle of the engine works; the cog rail weighs 66 pounds to the yard.

The road was about 3 miles long, but this spring, it was extended down $\frac{1}{2}$ mile more to connect with Boston, Concord & Maine R. R., which now runs to the base of the mountains. There are some pretty sharp curves on it; I forget the degree of curvature, at all events we run about as short curves as on ordinary roads. There is no switching apparatus as none can be used with centre cog rail, but there are turn-tables.

The original engines had only one pair of cylinders 16×16 inches, and all the power was applied to one axle, but this has been improved by using 4 cylinders 8×12 inches, and dividing the power between the two driving axles. The crank shaft on the engine is geared to the driving axle in a ratio that the piston makes $5\frac{1}{2}$ strokes to 1 of the driving axle.

Air is used in the cylinders when the train is coming down; gravity tends to force the train down hill, moves the pistons, and the engineer lets the air out of the cylinders as fast as he wants to run; there are other brakes besides.

The engine backs down the hill with the car above it. At first, upright boilers were used, but these have been abandoned for horizontal ones, set at an angle that will be level on an average grade. The engines weigh about 12 tons, the cars seat about 50 persons, and weigh about 3 tons. Only one car to an engine is run, but sometimes 80 persons are carried to a car—50 however are enough.

There is not much grading to the road, as the mountain is about all stone. Most of the

low places are spanned by trestle work; that over "Jacob's Ladder" is 27 feet high. The grade varies with the mountain up and down, although the least grade is a rise of 1 in 8.

The original capital was \$110 000, but it took all that to build the road; since, all the earnings of the road have been put into it, in the shape of rolling stock and improvements, till it now has cost over \$200 000. The road is not in debt, but has never paid a dividend.

7 000 passengers were carried last year, at a fare up and back of \$4. There are 5 engines and 5 cars, also 2 platform cars; sometimes not more than 10 passengers are carried in a day, and sometimes 200, depending on the weather. It is only a pleasure road, so freight is not carried, although a large hotel has been built on the summit, all of which was carried up over the road.

The receipts are about \$24 000 per year, half or more of which, it costs to run the road; it is only run for summer travel—say three months in the year.

Cog railroads were first used in England; there is one running into Madison, Indiana, one mile long, with a grade of 500 feet; it has been in operation since 1847, and always been run during summer travel, since the road was opened.

The road up Mount Rbiga, Switzerland, was built from this. Engineers were sent over who got leave and made drawings of this road and its engines.

MR. FRANCIS COLLINGWOOD writes: Having been requested to make such memoranda as he could, respecting the construction and operation of this road, during a recent visit to the White Mountains, the writer would present the following brief and necessarily somewhat imperfect description written from notes made hurriedly on the spot.

The inception of the work was due to Mr. Sylvester Marsh, of Littleton, N. H., who, after much opposition succeeded in building the first road—beginning April, 1866, and completing it in July, 1869. The first track was laid with the outer rails of light, flat iron. The locomotives also were imperfect, the boiler being vertical and filled by the use of a funnel, and having too small a steam space for the service required.

The present superintendent, Mr. Walter Aikin, of Franklin, N. H., has been in charge several years, and has entirely changed the character of the road and rolling stock, so that it is now in efficient working order, and has almost entirely superseded other modes of ascending the mountain.

The road is in two sections, one of $2\frac{1}{2}$ miles length, reaching from Fabyan's (the junction of the "Portland & Ogdensburg"—and the

"Boston, Concord, Montreal & White Mountains" railroads, to "Base Station." This portion has a maximum grade of 296 feet per mile, and is run by traction engines with ordinary cars.

The portion ascending the mountain, and hereafter exclusively considered, has a length of $3\frac{1}{2}$ miles. Its maximum grade (at a point called Jacob's ladder, ending at 1 mile from and 800 feet below the summit), is 1980 feet per mile; its minimum grade is 660 feet, and the average 1300 feet per mile. The vertical curves joining the various grades are quite sharp—but their radii were not learned. There are nine lateral curves, varying from 497 feet to 945 feet radius.

Comparatively little grading was done; low trestling, strongly braced, with bents about 12 feet apart, being used by preference. The Superintendent says, however, that he should change this, were he to reconstruct the road.

Where there is no trestle, heavy cross bearers of timber are bedded against rocks or into the soil, at about 12 feet apart. On these, are bolted longitudinal stringers, 8×12 inches. On these again, are placed sawed cross-ties, originally 4 feet, and since made 2 feet apart. Last of all, are placed a set of longitudinal stringers on top of the cross-ties. The outer ones are 4×7 inches, fastened by bolts reaching through the cross-ties and the lower stringer, every 2 to 4 feet. They support the outer rails, which are light iron rails, 30 pounds to the yard, without fish-plates but with joint-plates. They serve simply to support the car and engine. The middle stringer rests upon and is bolted to the cross-ties. It is 4×8 inches, and supports the central cog-rail. All the bolts, as nearly as could be seen, were screw bolts.

The cog-rail, which is the peculiar feature of this road, weighs 66 pounds, and cost \$6 per yard delivered at the base of the mountain. It is made in 12 feet lengths of two pieces of $3 \times 3 \times \frac{3}{8}$ inch-angle iron, placed 4 inches apart and joined by $1\frac{1}{2}$ inch-diameter round pins, placed 4 inches apart, centre to centre, and firmly riveted to the vertical flanges. The rail is, therefore, $10\frac{1}{2}$ inches wide, and projects $1\frac{1}{2}$ inches on each side beyond the stringer to which it is fastened. The reason for this will be seen hereafter. The lateral flanges were pierced for bolts at every 18 inches of length, but bolts were only used at every 3 feet of each angle iron. The pins are made of best Pembroke iron.

The gauge of the track is 4 feet $7\frac{1}{2}$ inches, owing to a fancy of the projector that he must have a close gauge. The original cost of the

$3\frac{1}{2}$ miles of road, with equipment, was about \$150 000; but this has since been increased by expenditures from earnings, to \$210 000. There are four water tanks at various points, supplied by springs in the vicinity; a turntable and small engine-house on the summit, and some cheap buildings at the base.

Each train consists of an engine and one car. The first locomotives built, having an upright boiler and but two steam cylinders, weighed $6\frac{1}{2}$ tons each. The latest, designed by Mr. Aikin and built in 1875 at the Manchester Locomotive Works, N. H., have 4 cylinders, a rigid wheel base (the length I did not learn), and weigh 12 tons each. They consume $\frac{1}{2}$ cord of wood each, per round trip. The cars measure 8×30 feet, inside measure, seat 50 persons, and weigh 3 tons each. There is no special arrangement of seats, as in the cars used on the Pittsburgh and other inclined railways. The boiler of the latter engine is of the ordinary locomotive type, except that the steam-drum is at the centre of length of the horizontal shell, instead of at one end. The shell is about 9 feet long (diameter I did not get), and inclined to the frame sufficiently to make it horizontal when the engine is on the average grade. On the level, the engine looks as though it had been in collision with another. As stated, each engine has 4 cylinders, 8×12 inches, each pair working on an independent crank shaft, geared respectively into gear-wheels on the forward and rear axles of the engine. The valves are ordinary slide valves, worked from eccentrics on the crank shafts, and cutting off at three-fourths stroke.

In addition to the steam and exhaust pipes, an air supply pipe is carried from each valve-chest into the cab, and provided with suitable cocks under the control of the engineer. He is by this means enabled, in going down hill, to shut off steam entirely, and run the train down against the air-pressure in the cylinders, the amount of compression being under perfect control. While thus working and discharging compressed air, the condensation of moisture caused by the rapid expansion of the jet, gives it every appearance of a discharge of steam. After many experiments, Mr. Aikin arrived at the following combination of gears: The pins in the rail, Pembroke iron; the central cog-wheels (one on each axle of the engine, and one on the upper axle of the cars), of best chilled car-wheel iron, 26 inches exterior diameter. At the roots of the teeth, the wheel is 4 inches thick, and at the ends, $3\frac{1}{2}$ inches; this allows for lateral play, curves, &c.

The gear wheels (two on each engine axle, and two on the upper car axle) are 33 inches exterior diameter and 4 inches thick, and made of gun metal. The pinions, two on each crank shaft on both car and engine, of 6 inch diameter, are made of steel. This gives about $5\frac{1}{2}$ revolutions of the engine to 1 of the driving wheels. The speed of ascent and descent of trains is about 2 miles an hour, or at the rate of an easy walk. The engine is always *below* the car, and entirely free from it, the bumpers simply coming in contact. The water-tank and wood-box are on the lower end of the engine, over the lower axle. The baggage crate, a simple platform, runs below all, and is attached to the engine by chains.

The means of stopping the engine are, *first*, a ratchet and pawl. The ratchet is about 2 inches in diameter and 5 inches face; it is placed on the upper axle; and the pawl is always playing as the train *ascends*. On going down hill the pawl is held up, but can be instantly dropped by the engineer. In addition to this, are powerful strap brakes on each axle.

For stopping the cars there are—*first*, a ratchet and pawl on the upper axle; *second*, a strap brake on the lower axle, or as in some recent cars, 2 shoe-brakes at each wheel; *third*, an ingenious atmospheric brake, worked by the upper axle of the car, through the gear mentioned and crank axle, corresponding in all respects to those on the engine. One of the brakes is placed on each side of the car, underneath, and consists of a plain cylinder, about 8×12 inches, with piston working in it air-tight, the piston being joined by connecting rod to the corresponding crank on crank shaft. A plain air passage connects the two ends of the shaft, so that the air is pumped alternately from one end to the other. A throttle valve is placed in this passage, which is under control of the brakeman; and he can, by lessening or increasing the opening,

increase or diminish the brake power, at will. As this axle is geared to the central rail, it will be seen that the car is positively held by the brake, and does not depend upon friction.

Mr. Alkin says, they find a great economy to result from a proper *oiling* of the central rail. This they do about once a week, by a can attached to the engine, with a properly adjusted opening.

No views of their most recent engines were obtainable, and the ones exhibited are of the older type. 7000 passengers were carried last year, without an accident, and no passenger has yet been hurt.

A gang of men is kept constantly on the line, and they have a means of descending the line which is both novel and interesting. Each man carries a kind of sled—a flat board, with cross-pieces for the feet and attachments. This slides on the central rail. Near the front end a brake is attached on each side, by a bolt running across the board. The handles of these, reach back to a convenient position for the rider to operate either by lifting or pressing down (according to the style of brake), and the brake takes hold on the under side of the projecting lip of the central rail. It requires large practice to work these safely, but Mr. Alkin says, an experienced rider will descend the length of the line in 4 minutes, and be able to stop anywhere he desires.

Some details of this road are given in the various guide-books, but they refer rather to the line as first laid, than as at present running.

There are many omissions, and no doubt, some inaccuracies, in this communication, which must be charged to the hurried manner in which the notes were taken, without time for revision and subsequent correction.

* A large photograph of the railway and a train, showing clearly the arrangement of track and centre rail, may be seen at the Society's rooms.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Animals, the Uses of—, in Relation to the Industry of Man. a Course of Lectures. E. Lankester. London. 12mo. *Hardwicke & Bogue*. 4s.

Archæology of Rome. The Aqueducts, traced from their Sources to their Mouths. John H. Parker. London. 8vo, illus. *Murray*. 15s.

— Discoveries at Ephesus; including the Site and Remains of the Great Temple of

Diana. J. T. Wood. London. 8vo. *Longmans*. 63s.

Architectural Sheet-Metal Work, Compendium of—, embracing Rules and Directions for Estimates, Items of Cost, Nomenclature, Tables of Brackets, Modifications, Details, Trusses, Stop-Blocks, Frieze-Pieces, &c. Architects' Specifications, Tables of Tin Roofing, Galvanized Iron, &c., &c.; to-

- which is added, the Exemplar of architectural Sheet-Metal Work, containing Details of the Centennial Buildings, and other important Sheet-Metal Work, Designs, and Prices of architectural Ornaments, as manufactured for the Trade, and a Catalogue of Cornices, Window Caps, Mouldings, &c. A. O. Kittredge. Philadelphia. 8vo. Baird. \$10.00.
- Art, a Manual of the historical Development of—; pre-historic, ancient, classic, early Christian; with special Reference to Architecture, Sculpture, Painting and Ornamentation. G. G. Zerff. London. 8vo. *Hardwicke & Bogue*. 6s.
- Azimuth Tables for correcting Compass Courses and Bearings, being the Sun's True Bearings, corresponding to apparent Time at Place. F. Labrosse. 3d ed. London. 8vo. *Van Nostrand, New York*. \$6.25.
- Birds of Great Britain and Ireland. William Gardiner. New ed., 4 vols. London. 12mo. *Hardwicke & Bogue*. 18s.
- Bridges: an elementary Treatise on their Construction and History. F. Jenkin. Reprinted from the *Encyclopædia Britannica*. Edinburgh. 4to. *Longmans, (London)*. 5s.
- Arch and Suspension Trusses. S. H. Shreve. New York. 8vo, illus. (*Van Nostrand*.) Announcement.
- Works in Iron Bridge and Roof Structures. E. Matheson, 2d. ed. London. 8vo. *Spons. (New York)*. 15s.
- Cement, Testing of Portland—J. J. Mann (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Eng.*
- Centi-Meter-Gramme, Illustrations of the—, second System of Units. Prof. Everett. London. 8vo. *Taylor & Francis*. 5s.
- Dynamics; or, theoretical Mechanics in Accordance with the Syllabus of the Science and Art Department. J. T. Bottomley. London. 12mo. *Collins*. 1s. 6d.
- Eclectic Engineering Magazine (*Van Nostrand's*). Vol. 15, July to December inclusive, 1876. New York. 8vo, illus. \$3.00.
- Fern Paradise. Francis G. Heath. 3d ed. *Hodder & Stoughton*. London. 8vo. 6s.
- Firearms, on the Influence of— upon Tactics; historical and critical Investigations by an Officer of superior Rank in the German Army. Trans. by E. H. Wickham. London. 8vo. *King*. 7s. 6d.
- Fishes; a History of British—. R. Hamilton. 2 vols. London. 12mo. illus. *Hardwicke & Bogue*. 9s.
- Trout Culture; a practical Treatise on the Art of spawning, hatching and rearing Trout. Charles C. Capel. London. 12mo. *Hardwicke & Bogue*. 2s. 6d.
- Forces; Application of physical—. Amédée Guillemin. Trans. by Mrs. Lockyer, ed. by J. Norman Lockyer. London. 8vo, illus. *Macmillan (New York)*. 36s.
- Forests and Moisture; or Effects of Forests on Humidity of Climate. John C. Brown. Edinburgh. 8vo. (*Simpkin, London*.) 10s. 6d.
- Furniture, Designs and Sketches for—, in the Neo Jacobean and other Styles. Bernard E. Smith. London. Folio, illus. (*Van Nostrand, New York*). \$21.00.
- Game, the large and small—, of Bengal and the Northwestern Provinces of India. J. H. Baldwin. London. 16mo. *King*. 21s.
- Gas; a practical Treatise on the Manufacture and Distribution of Coal—. William Richards. 4to, illus. *Spons. (New York)*.
- Geological Survey, Memoirs of —, England and Wales (English Government Publications). Geology of East Somerset and Bristol Coalfields; or Descriptions of the Rocks comprised in Sheet 19, part of Sheet 35, and adjoining Portions of Sheets 18, 20, and 21 of the (one inch) geological Survey Map of England. Horace B. Woodward. With Notes by H. W. Bristow, W. A. E. Usher, and J. H. Blake, and Appendix by F. Rutley, on the microscopic Character of the eruptive Rocks, and Lists of Fossils by R. Etheridge. London. 8vo. 18s.
- Geology of the northern Part of the English Lake Districts. Quarter-sheet 101 S. E., including Sheets 63, 64, 69, 70, 71, 76, and portions of 54, 55, 56, 57, 62, 65, 68, 73, 74, 75, Cumberland, and 12, 18, 19, Westmoreland, on Scale of 6 inches to Mile. J. Clifton Ward. With Appendix on New Species of Fossils. R. Etheridge. London. 8vo. 9s.
- Hydraulics and hydraulic Motors with Theory of the Steam Engine, trans. from Vol. II. of Weisbach's Engineering, by A. Jay DuBois. New York. *Wiley & Sons*. (Announcement.)
- , rural; a practical Treatise on rural Household Water Supply, giving a full Description of Springs and Wells, Pumps and hydraulic Ram, with Instructions in Cistern Building, Laying of Pipes, &c. W. W. Grier. Philadelphia. 8vo, illus. \$0.75.
- Iron Manufacture, a concise History of —, of the American Colonies up to the Revolution, and of Pennsylvania until the present Time. John B. Pearce. Philadelphia. 12mo, illus. *Allen, Lane & Scott*. \$2.00.
- Library, a Classification and Subject-Index for cataloguing and arranging the Books and Pamphlets of a Library. Melvil Dewey. Boston. 8vo. *Ginn & Heath*. \$1.00.
- Life, the Puzzle of —, and how it has been put together, a short History of vegetable and animal Life upon the Earth, from the earliest Times, including an Account of pre-historic Man, his Weapons, Tools, and Works. Frederick Waddy. London. 12mo, illus. *Longmans*. 5s.
- Magnetic Declination in the United States and other Parts of North America, the secular Change of—. Washington. 4to. *U. S. Coast Survey*.
- Mathematics complete: a Science Manual. H. Major. Manchester. 12mo. (*London. Simpkin*.) 2s. 6d.
- Masonry, Bricklaying and Plastering, theoretical and practical: the new Guide to—, Ed. by R. Scott Burn. London. 4to, illus. (*Van Nostrand, New York*.) \$21.00.
- Mining Engineers, Transactions of the American Institute of —. Vol. IV. May, 1875, to February 1876. Easton. 8vo, illus.
- Machinery, a descriptive Treatise on Machinery, Tools, and other Appliances used in Mining. G. G. Andre. (To be completed in 12 monthly Parts.) Part I. London. 4to, illus. *Spons. (New York)*. \$2.00.
- Mineralogy. Text-Book of —. E. S. Dana. New York. *Wiley & Sons*, (Announcement.)
- Mineral Statistics for 1875. (Parliamentary Report.) London. 8vo. 2s.
- Oils and Water Colors. William Renton. Edinburgh. 12mo. (*Hamilton, London*.) 5s.

Ordnance, Description of naval 3-Inch Breech-Loading Howitzers, with Instructions for their Use and Care. M. Sicard. Washington. 8vo, illus. *Gov. Printing Office.*

Petroleum, the early and later History of —, with authentic Facts in regard to its Development in western Pennsylvania, and Sketches of the pioneer and prominent Operators, together with the refining Capacity of the United States. J. T. Henry. Philadelphia. 8vo, illus. *Baird.* \$4.50.

Price Tables, specially designed for Use in the Iron, Steel, Brass, Copper, Lead, Tin, and Zinc Trades. George Beecroft, 6th ed., rev. and enl. by John O. Butler. Leeds. 12mo. (London. *Stimpkin.*) 16s.

Railways. Treatise on the Law of —. William Hodges, 6th ed., by J. M. Lely. London. 8vo. *Sweet.* 38s.

Railway Tires, the Fracture of —. W. W. Beaumont, with Abstract of Discussion (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Engineers.*

Rivers Pollution Prevention Act, 1876. W. G. Lumley. London. 8vo. *Shaws.* 3s. 6d.

Roof Trusses, graphical Analysis of —, for the Use of Engineers, Architects and

Builders. Charles E. Greene. Chicago. 8vo, illus. *Engineering News.* \$1.25.

Science, Familiar Lectures on some Mysteries and Discoveries in—. T. S. Philpson. London. 8vo. (*Van Nostrand.* New York.) \$3.75.

— Lectures on some recent Advances in physical—, with a special Lecture on Force. P. G. Tait. 2d ed., rev. London. 8vo. *Macmillan.* (New York.) 9s.

— Outlines of an industrial Science. David Syme. London. 8vo. *King.* 6s.

Steam Engine, a practical Treatise on the —, containing Plans and Arrangements of details for fixed Steam Engines, with Essays on the Principles involved in Design and Construction. Arthur Rigg. (To be completed in 12 monthly parts.) Part I. London. 4to, illus. *Spons.* (New York.) \$2.00.

Trigonometry, the Elements of plane —. H. N. Wheeler. Boston. 12mo. *Ginn & Heath.* \$1.25.

Universe (the). F. A. Pouchet. 4th ed. Edinburgh. 8vo. *Blackie.* (London.) 12s. 6d.

Vegetable Kingdom, the Effects of Cross and Self-Fertilization in the —. Charles Darwin. London. 8vo. *Murray.* 12s.

ADDITIONS TO

LIBRARY AND MUSEUM.

NOTE.—“Copies for distribution” named in this list, will, in order of receipt, be sent to members who apply, until the supply is exhausted.

DONATIONS ARE ACKNOWLEDGED AS FOLLOWS:

From American Institute of Mining Engineers:
Transactions. Vol. IV. May, 1875, to February, 1876. Easton.

From John Bogart, New York:
Third Annual Report of Board of Commissioners of Department of Public Parks. New York, from May 1st, 1872, to December 31st, 1873.

From T. C. Clarke, Philadelphia:
Proceedings of the American Philosophical Society for promoting Useful Knowledge. Philadelphia. Nos. 93-95, 97.

From Samuel S. Cox, M.C., Washington:
Annual Message of President of United States, December 4th, 1876, with Accompanying Documents. Washington.
Congressional Directory, XLIV Congress, 2d Session. Washington.

From J. J. R. Croes, Yonkers, N. Y.:
Department of Public Parks, New York. Reports of the Landscape Architect, and the Civil and Topographical Engineer, on laying out the 23d and 24th Wards, New York.

From M. S. Day, U. S. Navy:
Report of the Trigonometrical Survey of Island of Hokkaido, for 1875. New York.

From John Eaton, Commissioner of Education, Washington:
Public Libraries in the United States, their History, Condition and Management. Special Report. Parts I. II. Washington.

From C. Douglas Fox, London:
Institution of Civil Engineers: Charter, By-Laws and Regulations; Subjects for Papers, Session 1875-76. (2 numbers.)

From G. H. Frost, Chicago:
Graphical Analysis of Roof Trusses. Charles E. Greene, Chicago.

From S. T. Fuller, Philadelphia:
39th Annual Report of the Philadelphia, Wilmington & Baltimore R. R. Co. for year ending October 31st, 1876. Philadelphia.

From J. T. Gardner, Albany:
Relation between topographic Surveys and the Study of public Health. J. T. Gardner. Albany.

From G. E. Gray, San Francisco:
Techachapi Pass, on Line of Southern Pacific Railway (3 photographs).

From G. S. Greene, New York:
Department of Public Parks, New York. Specifications, &c., for building an Iron Bridge across Harlem River.

From Albert Hill, New York:
Analysis of Specifications for Steel Cable Wire for East River Suspension Bridge. Albert Hill. New York.

From Institution of Civil Engineers, London:

List of Members, January 1st, 1877.
Excerpts from Minutes of Proceedings. Sessions 1876-7, Part I., as follows:
Fracture of Railway Tires. W. W. Beaumont, with Abstract of Discussion.

- The Japan Lights with which the Japan Government has provided the leading Ports. R. H. Brunton; with Abstract of Discussion.
- Permanent Way of Railroads. R. Price Williams; with Abstract of Discussion.
- Testing of Portland Cement. I. J. Mann.
- From Capt. W. N. Jeffers, Chief of Bureau of Ordnance, Navy Department, Washington:
- Description of naval 3-inch Breech-Loading Howitzers, with Instructions for their Care and Use. Washington.
- From North of England Institute of Mining and Mechanical Engineers. Newcastle-on-Tyne, England:
- Transactions, September and October. Newcastle-on-Tyne.
- From P. H. Philbrick, Iowa City, Ia.: Catalogue of the State University at Iowa City, for 1873-4, 1875-6. (2 numbers.)
- From W. H. Paine, Brooklyn:
- Specifications for Steel Cable Wire for East River Suspension Bridge. (Copies for distribution.)
- From P. P. Panayeff, Moscow, Russia:
- Album of Patterns of Rails for Tramways. Map of Moscow.
- Treatise on Construction of dredging Machines and their Work. P. P. Panayeff, Moscow (Russian).
- From C. P. Sandberg, London:
- On Rail Joints—from "Engineer." London. (6 copies).
- From I. W. Smith, San Francisco:
- Act relating to Commissioners of Transportation of State of California, their Powers and Duties. Approved April 3d, 1876. Sacramento. (6 copies.)
- Form of Annual Report of Railroad Companies to the Board of Commissioners of Transportation of State of California, for year ending June 30th, 1876. Sacramento. (6 copies.)
- From Society of Architects and Engineers of Hanover:
- Journal of the Society. Vol. 12. Part IV. (German.)
- From the Society of Civil Engineers, Paris:
- Papers and Proceedings of the Society. September, October, 1876. Paris (French).
- From R. H. Thurston, Hoboken, N. J.:
- Exhibits of the Stevens' Institute of Technology at the Centennial Exhibition. Hoboken. (Copies for distribution.)
- From J. N. Tubbs, Rochester, N. Y.:
- Rochester Water Works. Specifications for Cast Iron Distribution Pipes with their Branches; for Excavation and Re-filling of Trenches for Water Pipes, and for Laying such Pipes. (2 numbers.)
- From United States Coast Survey, Washington:
- Secular Changes of magnetic Declination in the United States and other Parts of North America. Washington.
- From Union Iron Co., Buffalo:
- Plans of the Louisiana Draw Bridge (2 sheets).
- From Gen. G. K. Warren, Newport, R. I.:
- Report on the Transportation Route along the Wisconsin and Fox Rivers, in State of Wisconsin. Washington. (Copies for distribution.)
- From Miscellaneous Sources:
- American Library Journal. September 30th, 1876.
- Encyclopaedia Britannica. 9th edition. Vols. I-V. A to Cle.
- Library Table. Vol. II., No. 2. New York.
- Prospectus of American Wood Preserving Company. New York, 1870.
- Tribune Almanac and political Register for 1877. New York.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: regular meetings, when ballots for members will be canvassed, and other business done, Wednesday, March 7th, April 4th and May 2d; and stated meetings, for consideration of professional topics and enjoyment of social intercourse, Wednesday, February 21st, March 21st and April 18th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held March 7th, April 4th and May 2d, at 3 o'clock P. M.

A general meeting of the AMERICAN INSTITUTE OF MINING ENGINEERS will convene Tuesday, February 27th, at 8 o'clock P. M., at the rooms of this Society. One or more sessions will be held on Wednesday, at the Columbia College School of Mines. Wednesday

evening will be devoted to a *conversazione* at the rooms of this Society, in which members of both associations will take part. An informal discussion will be had on the advisability and practicability of adopting in this country the metric system of weights and measures.

PAPERS HAVE BEEN RECEIVED for presentation to the Society, since the last announcement, as follows:

Failure of the Railway Bridge at Ashtabula, Ohio.

G. K. Warren. January 18th, 1877.

E. S. Philbrick. February 6th, 1877.

"Levees, as a System of reclaiming low Lands."

Discussion—J. F. Flagg. Feb. 13th, 1877.

TITLE PAGE AND INDEX of Volumes II, Proceedings, is issued herewith.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. March, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

FEBRUARY 21ST, 1877.—A stated meeting was held at 8 o'clock P. M.

A paper by Charles Macdonald, C. E., of New York, on "The Failure of the Ashtabula Bridge" was read, and a discussion by Messrs. Thomas C. Clarke, Charles Hilton, Charles E. Emery and others followed.

MARCH 7TH, 1877.—A regular meeting was held at 8 o'clock.

A paper by J. Foster Flagg, C. E., of Meadville, Pa., in discussion of "Levees as a System of Reclaiming low Lands*" was read.

Reference was made to work of the Committee on "Quarters for the Society" and the best measures to be taken for purchase of a house for this purpose were considered.

Prof. Robert H. Thurston, Secretary of the United States Board to test Iron, Steel and other Metals, made a verbal report of its operations to date and of its present standing.

OF THE BOARD OF DIRECTION.

MARCH 5TH, 1877.—A special meeting for consideration of applications for admission to the Society was held at 3 o'clock P. M.

MARCH 7TH, 1877.—In absence of a quorum, no stated meeting was held.

* CXXI. Levees as a System of Reclaiming low Lands, by George W. R. Bayley. Transactions, Vol. V, page 115.

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Acoustics, Light and Heat. William Lees. Advanced Series. London. 12mo, illus. Collins. 2s. 6d.
- Altitude Tables —. Pocket. G. J. Symons. London. 32mo. Stanford. 2s. 6d.
- Antiquities, Half-Hours among some English —Lewellynn Jewett. London. 8vo, illus. Hardwicke & Bogue. 5s.
- Records of the Past, being English Translations of the Assyrian and Egyptian Monuments. Vol. VIII. London. Bagster. 3s. 6d.
- Art, Persian—R. M. Smith. (South Kensington Museum Handbook.) London. 12mo. (Van Nostrand. New York.) \$1.00.
- Architects and Engineers, Transactions of the Society of — at Hanover. Vol. XXIII., Part I. 4to, illus. (German.)
- Builders' and Contractors' Pocket Book of Prices and Memoranda for 1877. William Young. 4th ed. London. 32mo. Spons. (New York.) 3s. 6d.
- Architecture. Notes on the Churches of Derbyshire. J. Charles Cox. Vol. II. London. 8vo. Bemrose.
- School—being practical Remarks on Planning, Designing, Building and Furnishing School Houses. Edward R. Robson. 2d ed. London. 8vo. Murray. 18s.
- Birds of Prey (Our); or the Eagles, Hawks and Owls of Canada. Henry G. Vennor. Montreal. 4to, illus. (Worthington. New York.) \$12.00.
- Boilers, a Treatise on Steam—their Strength, Construction, and economical working. 4th ed., rev. Robert Wilson. London. 12mo, illus. Lockwood. 6s.
- Bookbinding at Home: a practical Treatise on Bookbinding. Plymouth. 8vo. McCallum. 6d.
- Botany, Aids to—consisting of brief Outlines, of the elementary Facts of the Science, including a Description of the most important Natural Orders. C. E. Sempie. 12mo. London. Bailliere. 1s.
- Brevets, the History and legal Effects of Brevets in the Armies of Great Britain and United States, from their Origin in 1692 to the present Time. Jas. B. Fry. New York. 8vo. Van Nostrand. \$3.50.
- Brewing on scientific Principles, the Art of—New ed., en, and imp. London. 18mo. Cornish. 2s. 6d.
- Bridge, Report of Chief Engineer of the New York and Brooklyn —. W. A. Roebling. Brooklyn. 8vo. Eagle Print.
- Bridges, Conditions of Resistance of Swing—Jules Gaudard (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. Inst. Civil Eng.
- Building, Home—a Book of Facts relative to Building, Living, Materials, Costs at about 400 Places from New York to San Francisco, containing original Designs of Buildings, with short descriptive Specifications; also extended Specifications of Materials and Labor, Merchandise and where it may be procured, Cost of Materials at about 400 Places, Descriptions and Statistics for 1876 of over 250 Cities, Towns and Hamlets. E. G. Hussey. 4to, illus. Hussey. \$5.00.
- Carriages, Treatise on military — and other Manufactures of the Royal Carriage Department. W. Kemmis. London. 8vo. 5s.
- Chemical Analysis, and Introduction to qualitative Analysis. F. Beilstein. Transl. from the 3d ed. by I. J. Oabun. New York, 12mo. Van Nostrand. \$0.75.
- Chemistry, the Principles of —; an introduction to modern Chemistry, for the Use of Students. Ira Remsen. Philadelphia, 12mo, Lea. (Announcement)
- Chemist's Manual; a practical Treatise on Chemistry (qualitative and quantitative Analysis), Stoichiometry, Blow-pipe Analysis, Mineralogy, Assaying, pharmaceutical Preparations, human Secretions, specific Gravities, Weights and Measures, &c., &c., Henry A. Mott. New York. 8vo, illus. Van Nostrand. \$6.00.
- Colorist, the textile—. Vol. II. Manchester. 8vo, illus. Palmer & Howe. 21s.
- Colors, the Absorption of Light, and the Colors of natural Bodies. (Science Lectures at South Kensington.) 12mo, illus. Macmillan. (New York.) 6d.
- Commercial Products of the Vegetable Kingdom, considered in their various Uses to Man, as furnishing Food, Clothing, Medicine, &c., and in their Relation to the Arts and Manufactures; forming a practical Treatise and Handbook of Reference to the Colonist, Manufacturer, Merchant and Consumer, on the Cultivation, Preparation for Shipment and commercial Value, &c., of the various Substances obtained from Trees and Plants entering into the Husbandry of of tropical and sub-Tropical Regions. P. L. Simmonds. 2d ed., rev. and imp. London. 8vo. Spons. (New York.) \$8.00.
- Electricity and the electric Telegraph. George B. Prescott. New York. 8vo, illus. Appletons. \$5.00.
- An Introduction to the Theory of —, with numerous Examples. Linnaeus Cumming. London. 12mo. Macmillan. (New York.) \$3.00.
- Electrometers. James Bottomley (Science Lectures at South Kensington) London. 12mo, illus. Macmillan. (New York.) \$0.50.
- Engineering Papers. Abstracts of —, in in foreign Transactions and Periodicals. Ed. by James Forrest. (Minutes of Proceedings, Institution of Civil Engineers, Vol. XLVI.) London. 8vo. Inst. Civil Eng.
- Engineers, Annual Report of the Chief of — U. S. Army, to the Secretary of War, for 1876. A. A. Humphreys. 3 vols. Washington. 8vo, illus. Gov. Printing Office.
- Papers on Subjects connected with the Duties of the Corps of Royal —, contributed by Officers of the Royal Engineers. Vol. XXIII. London. 8vo. (Van Nostrand. New York.) \$8.00.

- Entomology, economic —. Aptera. Andrew Murray. (South Kensington Handbooks.) London. 8vo. *Chapman & Hall*. 7s. 6d.
- Fairbairn, William, the Life of — partly written by himself. Ed. and com. by William Pole. London. 8vo, portrait. *Longmans*. 18s.
- Fire Chemistry, or Pyrology. W. A. Ross. London. 4to, *Spon.* (New York.) 36s.
- Food. Some Account of its Sources, Constituents and Uses. A. H. Church. (South Kensington Handbooks.) London. 8vo. *Chapman & Hall*. (Van Nostrand. New York.) \$1.00
- Geology of the eastern End of Essex (Walton Naze and Harwich. Explanation of Quarter Sheet 48 S. E., with the adjoining part of 48 N. E.) William Waitaker. London. 8vo. (*English Gov. Pub.*) 9d.
- Outlines of Field —. Prof. Geikie. (Science Lectures at South Kensington.) London. 12mo, illus. *Macmillan*. (New York.) 6d.
- Gold Worker, the practical —; or the Goldsmiths' and Jewelers' Instructor in the Art of Alloying, Melting, Reducing, Coloring, Collecting and Refining; the Processes of Manipulation. Recovering of Waste, chemical and physical Properties of Gold, with a new System of Mixing its Alloys. Solders. Enamels, and other useful Rules and receipts. George E. Gee. London. 8vo. *Crosby & Lockwood*. 7s. 6d.
- Injectors, their Theory and Use. Trans. from the French of M. Leon Pouchet (Van Nostrand's Science Series.) New York. 12mo. *Van Nostrand*. \$0.50.
- Insects Abroad; being a popular Account of foreign Insects. J. G. Wood. London 8vo. *Longman*. 14s.
- Social Life, mental Powers of — A. S. Packard, Jr. (Half Hour Recreations in Natural History.) Division I, in 12 parts. Boston. 12mo. *Estes & Lauriat*. Per part \$0.25.
- The various Contrivances by which Orchids are fertilized by — Charles Darwin. 2d ed., rev. London. 8vo, illus. *Murray*. 9s.
- Iron and Steel at the Vienna Exhibition. William P. Blake. Washington. 8vo, illus. (*Pease, New Haven*). \$1.00.
- Landscape Gardening, the Handbook of practical —, designed for City and suburban Residences and Country School-houses, containing Designs for Lots and Grounds, drawn to a scale, with Schedules, showing where each Tree, Shrub, etc., should be planted; Instructions how to form Lawns, Build Roads; on Turfing, Protection and care of Trees Cuttings, Evergreens, Hedges, Screens, etc.; Perennials, herbaceous Plants, etc.; Descriptions of leading Trees and Shrubs, with Remarks as to Soil and Position. F. R. Elliot. Rochester. 8vo, illus. *Dacey*. \$1.50.
- Majolica and Fayence, Italian, Sicilian, Majorcan, Hispano-Moresque, and Persian. Arthur Beckwith. New York. 12mo, illus. *Appleton*. \$1.50.
- Malster, (the) a compendious Treatise on the Art of Malting in all its Branches. W. R. Loftus. New and rev. ed. London. 12mo, *Loftus*. 3s. 6d.
- Mechanical Engineers. Proceedings of Institution of —, October, 1876. Birmingham. 8vo, illus.
- Metal Work, illustrating the chief Processes employed by the Goldsmith, Silvermith, Jeweler, and Art Workman in Brass, Copper, Iron, Steel, Bronze or other Metal, in 40 parts. London. 4to, illus. *Virtue*. (Announcement.) Per Part 1s.
- Metallurgical Processes. A. W. Williamson. (Science Lectures at South Kensington.) London. 12mo. *Macmillan* (New York.) \$0.20.
- Microscopical Examination of Crude Drugs and other Vegetable Products. Mark W. Harrington. Ann Arbor. 12mo. *Sheehan & Co.* (Van Nostrand, New York.) \$0.40.
- Microscopist the —, a Manual of Microscopy and Compendium of the microscopic Sciences, Micro-Mineralogy, Micro-Chemistry, Biology, Histology and Pathological Histology. J. H. Wythe. 3d ed., rewritten and enl. Philadelphia. 8vo, illus. *Lindsay & Blakman*. \$4.50.
- Mining, Lectures on —. J. Callon, trans. by P. Le Neve Foster and W. Galloway. Vol. 1: text, 8vo: 4to Atlas of plates. London. *Dulau*. 23s.
- Money, bi-Metallic —. Emile de Lavaleye, trans. by George Walker. New York. 8vo. *Banker's Mag. Off.* \$0.30
- Natural History, Curiosities of —. 1st Series. Francis T. Buckland. New ed. London. 12mo. *Bentley* 3s. 6d.
- Nautical Magazine for 1876. London. 8vo. *Simpkin*. 15s.
- Naval History, a Text-Book of Facts for the Use of Students. John Thompson. Washington. 12mo. *Skillington*.
- Navigation made easy; or the Mariners' daily Assistant and Self-Instructor. Henry Marshall. New York, 8vo. *Van Nostrand*. \$1.50.
- Ornament, modern Surface —. Original Designs, in 6 parts of 4 Plates each. New York, 4to. *Sabin*. Per part \$1.00.
- Percentage, the 30 possible Problems of — embracing a full and exhaustive Discussion of the Theory of general Percentage. W. H. Bradford. Weedsport, 16mo. *Bardeen & Co.* \$0.25.
- Perspective, third Grade — in 12 Parts. H. J. Dennis. London, 16mo. *Bailliere*. Per part 1s.
- Political Economy, Introduction to —. Arthur L. Perry. New York, 12mo. *Scribner*. \$1.50.
- Photography, Annual of — and photographic News Almanac for 1877. London, 12mo. *Piper*. 1s.
- Pumps. History and theoretical Laws of centrifugal — as supported by Experiment and their Application to this Design. R. Clerc Parsons. (Minutes of Proceedings, Institution of Civil Engineers.) London, 8vo, illus. *Inst. Civil Eng.*
- Railroad Commissioners of Massachusetts, Eight Annual Report of the Board of —. Boston. 8vo.
- Railway Passengers and Railway Companies; their Duties, Rights and Liabilities. Louis A. Goodeve. London, 8vo. *Stevens & Haynes*. 5s.
- Ship-Building on the Merrimac River. Historical Sketch of —. John J. Currier. Boston. 8vo. *Williams* \$0.50.
- Slide Rule. Hand-book of —. W. H. Bayley. New and rev. ed. London, 12mo. *Bell & Sons*. 5s.
- Steam Engine. Pocket-book on the compound —. N. P. Burgh. London, 16mo, illus. *Lockwood & Co.* (Van Nostrand, New York) \$3.75.

Trees. Hand-book of hardy Trees, Shrubs, and herbaceous Plants, containing Descriptions, native Countries, &c., of a selection of the best Species in Cultivation; together with cultural Details, comparative Hardiness, Suitability for different Situations, &c., based on the French of Decaisne and Naudin. W. B. Hemsley. London, 8vo. Longmans, 12s.

Water System, the Chalk —. Joseph Lucas. With abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London, 8vo. Inst. Civil Eng.

Weather, the —: a new Plan of forecasting Gales and Floods, and a new Theory of the Cause of Earthquakes, described in a Series of Letters, with Diagrams and an explanatory Preface. W. G. Weuley. Chelmsford, 8vo. (Simpkin. London.) 1s. 6d.

Wire Rope. Transmission of Power by —. Albert W. Stahl. (Van Nostrand's Science Series). New York, 12mo. Van Nostrand. (Announcement.) \$0 50.

Wool-Carder's Vade Mecum, a Hand-book containing History of the woolen Industry. W. C. Bramwell. Terre Haute, 16mo. (Van Nostrand. New York.) \$1.00.

Wool-Dying, Six Cantor Lectures on —, delivered before the Society of Arts. George Jarmain. Rep. from the Journal, Manchester, 8vo. (Simpkin. London.) 2s.

Year book of Facts in Science and the Arts for 1876. James Mason. London, 8vo. Ward & Lock. 2s. 6d.

Yellowstone National Park, and the Mountain Regions of Portions of Idaho, Nevada, Colorado and Utah. F. V. Hayden. Boston, 4to, illus. Prang. (Announcement.)

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular meetings*, when ballots for members will be canvassed and other business done, Wednesday, April 4th, May 2d, and June 6th; and *stated meetings*, for consideration of professional topics and enjoyment of social intercourse, Wednesday, March 21st, April 18th and June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held April 4th, May 2d and June 6th, at 3 o'clock P. M.

At the next *regular* meeting of the Society (April 4th), ballots for members will be canvassed; the Paper by Charles Macdonald, C. E., of New York, on "The Failure of the Ashtabula Bridge," read February 21st, will be discussed, and other business done.

THE NINTH ANNUAL CONVENTION of the Society will be held in New Orleans, Tuesday, Wednesday and Thursday, April 24th, 25th and 26th next.

Sessions for the consideration of professional subjects, and one for the transaction of regular business, will be held at the Chamber of Commerce (on Common Street), beginning at 9½ o'clock A. M. Tuesday, and continued on Wednesday.

It is proposed, on Thursday to visit objects of interest in and about New Orleans, and to have the Convention dinner at 7½ o'clock that evening; on Friday and Saturday, to inspect the jetties at the mouth of the Mississippi, stopping on the return at the orange groves and at some of the sugar plantations; and on Monday to go to the Bonet Carre Crevasse.

A trip to Galveston (by steamer leaving New Orleans, Wednesday, May 2d), to visit that city and the United States works there, is also proposed.

In accordance with the rules governing Conventions,* a list of topics to be considered at the regular sessions is submitted, with references to the Papers treating these subjects, published in Transactions since May, 1876.†

I. BRIDGES

CXXXVII. The Failure of the Ashtabula Bridge. C. MACDONALD. *March.*

CXL. Approximate Determination of Stresses in the Eye Bar Head. W. H. BURR. *April.*

II. HYDRAULICS.

CXXV. On the Failure of the Worcester Dam, a Report. T. G. ELLIS, Chairman. *July.*

CXXVI. Cut-offs on the Mississippi River, their Effect on the Channel, above and below. C. G. FORSHEY. *September.*

CXXX. Efficiency of Steam Vacuum Pumps. J. F. FLAGG. *December.*

CXXXI. Principles of tidal Harbor Improvements, as applied at Wilmington, Cal. C. B. SEARS. *December.*

CXXXVI. A Water Conduit under Pressure. J. T. FANNING. *March.*

CXXXIX. Consumption and Waste of Water delivered by public Works. J. H. HARLOW. *April.*

Report of Committee on Gauging of Streams. J. J. R. CROES, Chairman. *To be called for.*

* Proceedings, Vol. I, page 172.

† This list will be corrected and completed, in April Proceedings.

III. MASONRY.

CXXXIII. Reconstruction and Enlargement of the Cork Run Tunnel, on the Pittsburgh, Cincinnati & St. Louis Railway. M. J. BECKER. *January.*

CXXXIII. Notes on Masonry of the East River Bridge. F. COLLINGWOOD. *January.* Report of Committee on the Nomenclature and Classification of Masonry. J. J. R. CROES, Chairman. *June, and to be called for.*

IV.—RAILROADS.

CXXXVIII. On the Form, Weight, Manufacture and Life of Rails, a Report. A. WELCH, Chairman. *October.*

CXXIX. A cheap Transfer Table. W. P. SHINN. *December.*

CXXIV. On Railroad Accounts and Returns. W. P. SHINN. *June.*

Report of Committee on uniform Accounts and Returns of Railroad Companies. W. P. SHINN, Chairman. *November, and to be called for.*

Report of Committee on Resistances of Railway Trains. W. P. SHINN, Chairman. *To be called for.*

V.—STRENGTH OF MATERIALS.

CXXVII. Qualities of Iron and Steel. W. METCALF. *October.*

CXXXIV. The Rate of Set in Metals subjected to Strain for considerable Periods of Time. R. H. THURSTON. *January.*

Report of Committee on Tests of American Iron and Steel. W. S. SMITH, Chairman. *November, and to be called for.*

VI.—MISCELLANEOUS.

CXXXV. A Memoir of American Engineering. J. B. JERVIS. *February.*

CXXXVIII. Co-Ordinate Surveying. H. F. WALLING. *March.*

Report of Committee on Metric System of Weights and Measures. C. HERSCHEL, Chairman. *To be called for.*

The following are set down for

THE BUSINESS SESSION :

Report of the Centennial Commission of the Society. T. G. ELLIS, Chairman. *To be called for.*

Report of Committee on Quarters for the Society. J. BOGART, Chairman. *To be called for.*

The topics will be taken up for discussion in order, and members are invited to take part in person, or by sending what they would say ; it is hoped that those having memoranda of experience or data relating to any of the subjects named, will present it. Papers on other professional topics are solicited, and if announced in time, their titles will be included

in the Schedule to be published in April Proceedings. Notice of intention to present a Paper or to take part in the discussion, should be given to the Secretary *at once.*

The Boston Society of Civil Engineers, of Boston ; the Civil Engineers' Club of the Northwest, of Chicago ; and the Engineers' Club of St. Louis, have been invited to attend the Convention, and to take part in the proceedings.

It is proposed that Eastern members proceed together from New York, join the Western members at Louisville, and go from there, either by rail to Memphis and steamboat down the Mississippi, or by rail direct to New Orleans. The time (in hours) required will be about as follows :

New York to Louisville, rail.....	31
Louisville to Memphis, ".....	16
Memphis to New Orleans, river.....	36
	— 83
New York to New Orleans, all rail,..	65

As soon as arrangements are completed, a time-table and schedule will be issued.

Head quarters of the Society in New Orleans will be at the St. Charles Hotel.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society ; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th, next. The conditions of award are set forth in the Code of Rules, herewith published ; a copy will be furnished to members upon application.

A PAPER HAS BEEN RECEIVED for presentation to the Society since the last announcement, as follows :

The Failure of the Ashtabula Bridge.

C. MacdonaldFebruary 21st, 1877.

ADDITIONS TO LIBRARY AND MUSEUM, to contain acknowledgments of contributions to the Library, through the Centennial Commission of the Society (referred to, in Transactions. Vol. VI, page 59), will appear in Proceedings for April.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows :

On books, pamphlets, periodicals, maps and corrected proof sheets, *one cent per two ounces*; on photographs, lithographs, and engravings, *one cent per ounce*; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, *three cents per half ounce*. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with *once or twice* the deficiency, according to class; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

AS APPENDIX to this number of Transactions (by the courtesy of W. A. Roebling, Chief Engineer, and C. C. Martin, W. H. Paine F. Collingwood, and G. W. McNulty, Assistant Engineers), is issued:

Report of the Chief Engineer of the New York and Brooklyn Bridge, January 1st, 1877.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
COXE, ECKLEY B.....Drifton, Pa.....	February 7, 1877.
GUNNELL, WILLIAM C.....Eng. of New Capitol, Hartford, Conn.	" " "
HORTON, SANDFORD.....176 Franklin street, New York.....	" " "
MCComb, DAVID E.....As't Eng. on Work, west of Capitol, Washington, D. C.	" " "

CHANGES AND CORRECTIONS.

BILLIN, CHARLES E.....	4039 Locust street, Philadelphia, Pa.
BURR, JAMES D.....	Sup't Bridges and Buildings, A. T. & S. F. R. R., Topeka, Kansas.
COOPER, THEODORE.....	Office of Ch. Eng. Erie R'y, New York.
DOANE, EDWIN A.....	Box 317, Meadville, Pa.
GRAY, SAMUEL M.....	City Eng., 17 N. Main st., Providence, R. I.
HILL, JOHN W.....	Box 729, Hamilton, O.
JORDAN, GABRIEL.....	Ch. Eng. & Gen. Sup't, M. & C. R. R., Memphis, Tenn.
LEAVITT, ERASMUS D., Jr. .	143 Magazine street, Cambridgeport, Mass.
MCLINTOCK, WILLIAM H. .	As't Eng. Water Works, 175 Third av., Louisville, Ky.
TALCOTT, COOK	San Francisco, Cal.
TYSON, HENRY.....	Box 707, Baltimore, Md.
WHITE, W. HOWARD.....	13 Revere st., Boston, Mass.
WHITFORD, OSCAR F.....	Joplin, Mo.

RESIGNED.

SARGENT, JOHN H.	Cleveland, O.	February 28, 1877.
-----------------------	--------------------	--------------------

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. April, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MARCH 21ST, 1877.—A quorum not being present, no stated meeting was held.

APRIL 4TH, 1877.—A regular meeting was held at 8 o'clock, P. M.

The vote on admission to membership was canvassed and the following declared elected: Members—Caleb W. Durham, of Chicago, Ill.; Mordecai T. Endicott of New London, Conn.; Bryant Godwin of Albany, N. Y.; Thomas S. Hardee and Benjamin M. Harrod of New Orleans, La.; Thomas C. Keefer of Ottawa, Can.; Louis J. le Conte of Oakland, Cal., and Nathan M. McDowell of Alleghany City, Pa.; Associate—Arthur S. Hardy of Hanover, N. H., and Junior, George O. Knapp of Hartford, Conn.

A paper by Julius E. Streidenger, C. E., of New York, on "The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses," was read by him and discussed by Messrs. Francis Collingwood, Charles E. Emery, Edward P. North, Richard P. Rothwell and others.

A portfolio containing photographs of the principal bridges and other structures on the Lake Shore & Michigan Southern R. R., given to the Society by Mrs. Charles Collins, in behalf of her deceased husband, the late Chief Engineer of that road, was presented with a letter from her, and the President and Secretary were instructed to formally express to the donor the thanks of the Society for this valuable addition to the Library.

Announcement was made that Theodore G. Ellis had been appointed member of Committee on Library, in place of Matthews N. Forney, resigned from that committee and appointed member of Committee on

Finance ; also that of those appointed under resolution adopted February 7th last, as a committee to report to the Society a form of memorial to Congress to further the adoption of metric standards, Messrs. Clemens Herschel, Robert Briggs and Frederick Brooks had accepted, and Messrs. Julius E. Hilgard and Theodore G. Ellis had declined.

Certificate of award to the Society by the "United States Centennial Commission, International Exhibition, 1876," for "drawings, photographs, models, manuscripts and various publications illustrating the work of the Society and the progress of Civil Engineering," and a letter of thanks from the American Institute of Mining Engineers, by Prof. Thomas M. Drown, Secretary, for courtesies shown the association during its February meeting, were read.

The death, on January 10th, of William Grain, C. E., late of Fergus, Ontario, Can., and Member of the Society from February 16th, 1870, was announced, and it was moved that a committee be appointed to prepare a memoir of the life and professional services of the deceased.

The following amendments to the By-Laws were proposed by J. James R. Croes and seconded by Edward P. North ; under the rule, consideration was deferred to a subsequent regular meeting of the Society.

SECTION.—First. Votes for officers of the Society at the annual meeting in November may be sent by mail, enclosed in two sealed envelopes, the outer one of which shall be endorsed with the voter's signature, and all such votes shall be counted on the first ballot for officers.

Second. If it should appear that, for any office a majority of the votes cast were not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. In case three or more names have received an equal number of votes, the choice shall be made from among those names.

Third. At the Annual Convention, a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of October ensuing, the names of the persons selected by them as candidates for officers. Of these, at least one Vice-President, three Directors, the Secretary and the Treasurer shall be Resident Members.

Fourth. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society, and shall issue, at least twenty days before the Annual Meeting, a letter ballot containing the names thus proposed.

Fifth. Any five members, not officers of the Society, may present to the Board of Direction, on or before October 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot.

Sixth. No member of any Nominating Committee shall be presented by such committee as a candidate for office.

APRIL 18TH, 1877.—A stated meeting was held at 8 o'clock, P. M.

A letter, dated January 29th, 1799, from Gen. Philip Schuyler to Richard Varick, Mayor of New York, in regard to supplying the city with water from the Bronx River, was read and a copy of same presented to the Society by John Schuyler.

Discussion of the paper by Charles Macdonald, C. E., on the "Failure of the Ashtabula Bridge" was resumed, and communications relating to the subject, from Squire Whipple and Alfred P. Boller, were read.

OF THE BOARD OF DIRECTION.

APRIL 4TH, 1877.—A stated meeting was held at 3 o'clock P. M.; reports of committees were presented and considered, change of quarters of the Society determined upon, appropriations made, and business relating to payments of bills, members' back dues, and other financial matters was done.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

TESTS OF AMERICAN IRON AND STEEL.—At the meeting of the Society, March 7th, 1877, Prof. Robert H. Thurston was called upon to report the status of the "United States Board appointed to test Iron, Steel and other Metals." He gave an account of the origin of the movement to obtain the appointment of such a Board, and described the organization of that body, its plans and methods of work, its present position and its purposes for the future.

He remarked that the Board, having apparently reached very nearly the end of its history, it might be well to look to the beginning of the work. He proposed to follow closely the line of discussion pursued when making a similar statement, by request, before the Senate Committee on appropriations, March 6th, at which time he had been asked as Secretary of the Board, to give an account of operations.

This plan of a systematic and thorough determination of the properties of the materials of construction made in the United States, and the scheme of making a really scientific examination of the composition and value of the metals used in their production, had an origin in two serious needs, and at a period which ante-dated the speaker's entrance into the Society. These two necessities arose from commercial conditions and from the requirements of constructing engineers.

We have been for years, importing cast iron from abroad while we have domestic products of equal and even greater intrinsic value selling in our markets at lower price. We are importing boiler plate at 11 cents a pound when we can purchase American steel, vastly superior in all respects for the special purposes to which the former is applied, at 8 cents. We import vast quantities of foreign steel tools, when, at Pittsburgh and elsewhere, we make steel fully its equal. In New England and Pennsylvania, we have ores from which are made the finest cast-iron ordnance in the world. In Ohio, we make a metal for car-wheels such as never is seen in Europe, and of such tenacity and elasticity that foreign engineers listen incredulously when it is described. Our Lake Champlain ores make an iron equal to even Swedish for conversion into steel, and around Lake Superior and Missouri we have deposits from which come Bessemer metal vastly superior to the phosphorus-charged metal imported. New Jersey supplies us with zinc which meets with no competition as a pure metal and which can be used without purification for even chemical purposes; and our native copper is, as I know by experiment, absolutely free from admixture with injurious elements.

Yet, notwithstanding the fact that we possess the purest and best ores and make the best metals, we continue purchasing abroad.

This fact arises : *first*, from a natural conservatism which induces us to continue to pursue a course to which we have been accustomed even after we knew it to be an improper one ; *second*, partly from that unfortunate American habit of self-depreciation which assumes, whatever comes from abroad to be, from that fact, superior to the product of our own country and of our own industry ; and *third*, from the fact that our own people do not know and cannot readily be made to believe that our own materials are so excellent.

It was to meet the last difficulty, partly, that this Board was proposed. No private individual can afford to attempt the systematic and only truly economical methods of development of these facts, and no one has interest so general as to make it imperative that he should do so, were it in his power. Even were the work done, and well done, by a combination of private interests, it would still have comparatively little value, as the public invariably looks with distrust upon all statements made by private individuals, and suspects that private interests may have given tone to their reports. The maker of the very best iron, or of the best possible steel, cannot prove beyond cavil that his product is better than any similar metal purchased abroad. Only the general government can institute an investigation that shall cover the whole field, that shall be systematic and scientifically thorough, and of which the reported results shall be accepted without distrust.

The second of the two classes of necessities leading to the creation of the Board was felt most keenly by our engineers and constructors, and by our manufacturers of machinery and of parts of structures. They knew comparatively little of the strength of our metals in small parts, and were still more seriously ignorant of the effect of making up any material in large sections and into the heavy members of bridges and other structures. They could not predicate dimensions on well ascertained measures of the strength of our iron, and were ignorant of the loads which could be sustained by heavy beams, girders, and columns made of this or of any other metals.

For years, they had been compelled to base their calculations on tables of strength of materials furnished by foreign experimenters, as Hodgkinson, Tredgold, Barlow, Morin, Rondelet, and Muschenbroeck, who gave the results of experiments on Carron iron and other metals, whose names were strange to American engineers, and which our builders never use. Recently, Kirkaldy, Styffe and some German experimenters have given us

valuable information, but nothing of any considerable value has been published in reference to our domestic materials.

These facts, and many more which the speaker had not time to consider, led to the appointment by the Society, several years ago, of a committee to secure the inauguration of scientific and exhaustive examination of our American materials by a Government commission. This committee sent a delegation of its own members, and of other members of the Society, before the House Committee on Appropriations, in the spring of 1875, and secured the modification of a bill already in committee, which had originated with the Architect of the Treasury, and its adaptation to the plan proposed. Under the provisions of a bill thus secured from Congress, the President appointed a commission, consisting of two army and two navy officers and three experts from civil life ; and this Board was organized and immediately adopted a very comprehensive plan of research, which was reported to the Society a year ago.* Committees appointed to carry out the investigations proposed, issued circulars, which were published in all scientific and engineering periodicals, as well as in the Transactions of the Society, and which detailed these plans of work and asked advice and information. These circulars brought out very little useful material.

The Board contracted for a large testing machine, combining the plans of Messrs. Albert H. Emery and Charles E. Emery—the latter a Member of this Society—which machine was expected to have been long ago completed, but is not yet ready for work. It was intended to test large pieces, as heavy beams, girders, and columns.

While awaiting the completion of the machine, the Committees of the Board conducted their special investigations, where they could do so without the use of the large machine, making use of such other machines as were available.

Some of the Committee have reports, either completed or in progress. The Committee on Wrought Iron had finished several investigations of the methods of making iron, on the effect of impact on metal, on the effect of various strains, &c., &c. The Committee on Chain Cables has been studying the methods and material of cable manufacture. The Committee on Tool Steel had completed a series of tests of the value of steels for cutting tools ; analysing them to determine

* See Vol. I., page 222 ; Vol. II., page 26, &c.

their composition, and breaking them to ascertain their mechanical properties. The report is in preparation. The Committee on Abrasion and Wear had completed that portion of its work formerly reported as in progress. The Committee on Metallic Alloys has determined the tenacity and other forms of resistance of all copper-tin alloys, their ductility, resilience, density, &c.; and the report is complete and in the hands of the copyist. A similar series of tests of copper-zinc alloys has been completed, and the report is in preparation; and an investigation of the properties of triple alloys of copper, tin, and zinc is in progress. The speaker described the methods of research adopted and indicated the general nature of results attained. The Committee on the Effects of Temperature has collected a large quantity of materials for test, and is still getting samples. The investigation is planned, but not yet commenced.

As just indicated, the Board has been working steadily for two years while awaiting the construction of its testing-machine—has done a large amount of work, and has completed, or has in preparation, some extended and probably valuable reports. The Board has been criticised because no reports have been yet made public. It should be remembered that where researches require months for their prosecution, the preparation of reports upon them usually requires an equal length of time, or sometimes greater. The speaker has sometimes acquired information in one day's work, which he had been unable to reduce to proper shape for publication in many days. Such criticism is evidently unjust, and never comes from those who have had experience in a kind of work in which the results of weeks of investigation are sometimes expressed in a single paragraph. Furthermore, the Board can only report to the President at the proper time, and the reports can only reach the country through the action of Congress. They can, therefore, not be presented piecemeal or at any desired date.

The speaker was permitted to state ascertained facts, but the Board had no authority to publish the reports in which only those facts could be found in their proper relations, except by presentation to the President, and publication under Act of Congress.

The speaker then described some methods of research adopted, and stated some interesting facts brought out by their application, including the reasons of variation of strength of iron and steel in bars of different sizes, the effect of strain after periods varying from one second to one year, the relation of composi-

tion and of strength and ductility to the value of steel for tools, the methods which had enabled him to determine the mechanical proportion and value for constructive purposes of all possible copper-tin, copper-zinc, and copper-tin-zinc alloys, the purposed methods of determining the effect of temperature, etc., etc.

The speaker stated that reports of progress had been made to the President, and that, a year ago, Congress had been requested to make an appropriation to enable the Board to continue its work, and to do some heavy work with its testing machine. The appropriation was granted by the Senate, but defeated by the House Committee. The same experience had been met with during the session just closed. No opposition had been met with either in the Senate or on the floor of the House, and every well known member of either party, and especially those of recognized intelligence and standing, had taken real interest in the matter. The House Committee, with but one or two exceptions, had, however, determinedly refused, and had even inserted a provision in the Sundry Civil Bill of 1876-7, extinguishing the Board, when the money in hand should have been expended.* That provision remains a law. The appropriation in hand will be expended during the coming year, 1877-8, and this Board, which had been procured and sustained by such earnest action, and so great an amount of hard work on the part of members of the Society, will be disbanded just as its plans and methods are thoroughly settled, and are bringing forth abundant fruit, and just as it is ready to undertake the most important of its researches—that on large parts of structures.

It is possible that earnest and determined action on the part of the Society, may preserve it, but it can only be done by taking steps as will convince the members of the House Committee on Appropriations of the next Congress:—

1st. That this work is of national importance in developing our mineral resources and manufacturing industries, and in securing safety of all large constructions; that it is an absolute necessity.

2d. That no individual can do such work, and that no combination of private individuals can make a complete and satisfactory investigation, even were the results of such work likely to be accepted as authoritative as would be the right of a Government commission.

3d. That, while this work is as appropriately

* Vol. II, page 100.

a matter of general legislation as the support of the Patent office, the Department of Agriculture, or of topographical and hydrographical surveys, it will secure returns of incalculable value, with insignificant expenditure.

If members of the House Committee can be shown these facts, the Board may possibly be continued; but it will only be by such convincing evidence as will fully controvert their pre-existing ideas, and convert them to a broader and more liberal faith. The Board has been formally endorsed by this Society, by the American Institute of Mining Engineers, the Iron and Steel Association, by all the technical schools, and by other institutions of learning, and has kept the members of the committees informed of the progress of its work. It has not been successful in securing proper recognition, notwithstanding all this, and notwithstanding the efforts of prominent men of both parties in Congress. It has done all that it, in propriety, can do, and will probably now, simply present its reports on Committee work, state its readiness to go on with the greater work assigned it, and leave the matter to be decided as shall be determined by the House Committee on Appropriations, in the light of such evidence as they may thus be given. There is imminent danger that the Board will be discharged before it can report on the strength of a single 15-inch beam, or determine a single law re-

lative to the resistances of parts of structures. It has, however, accepted its duties, and has undertaken them in good faith. Its members have discharged their duty faithfully, so far as they have been permitted, and have devoted, voluntarily, a vast amount of time to special research without compensation, and their only regret will arise from a natural reluctance to see their work interrupted, just when most certain to prove useful, and from the disappointment which, in common with all interested in the movement, they must feel at this premature interruption of a great and needed work.

They will find some slight compensation in the facts that they have, at least, organized a scheme which may, at some future time, be carried out by abler minds, that they have stimulated foreign nations to the consideration of the necessity of doing similar work, and thus, indirectly benefitting the world, and that they have been permitted to collect some valuable information in several important fields.

The speaker concluded by stating his belief that the importance of the subject and the evident and eager interest which had been taken in the matter by nearly all the members of the Society, would justify him in having so fully and freely stated the present status, and probable future of the Board appointed to test Iron, Steel and other Metals.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Alcohol, Results of Researches in —. Benjamin W. Richardson. London. 12mo. *Tweedie*. 6d.

Algebra, New Developments of —, containing many valuable Rules, Hints, and Suggestions never before published, designed to abridge and facilitate the Labor of Teachers and Students. T. Henderson. Philadelphia. 12mo. *Claxton, Remson & Heflinger*. \$1.00.

American Register, or Blue Book for 1877. J. Disturnell. New York. 8vo. *Disturnell*. \$2.60.

Animal Kingdom (the); arranged after its Organization: forming a Natural History of Animals. G. Cuvier, with Additions by W. B. Carpenter and J. O. Westwood. New ed. London, 8vo, illus. *Hardwicke & Bogue*. 21s.

Anthracen; its Constitution, Properties, Manufactures, and Derivations, including artificial Alizarin, Anthrapurpurin, &c., with their Application in Dyeing and Printing. G. Auerbach. Trans. and ed. from the rev. Manuscript of the Author by Wm. Crookes. London. 8vo. *Longmans*. (Van Nostrand. New York.) \$6.00.

Architectural Styles, a Handbook of —. A. Resengarten, trans. from the German of W. Collett Sanders. London. 8vo, illus. *Challo & Windus*. 21s.

Art, a Manual of the historical Development of —, prehistoric, ancient, classic, early Christian. G. G. Zerff. New York. 12mo. *Scribner, Welford & Armstrong*, \$3.00.

— Principles and Practice of —. J. D. Harding; ed. by William Walker. New ed. London. Folio. *Kent*. 52s. 6d.

- South Kensington Art and Science Handbooks. Conferences, held in Connection with the special Loan of scientific Apparatus, 1876. Physics and Mechanics, by Spottiswoode, Huggins, Lockyer, Thomson, Tyndall, Boscawnet, Chappell, Earl of Rosse, De La Rue, Whitworth, Merrifield, Russell, Kennedy, Stevenson, and others. (London reprint.) New York, 12mo. *Scribner, Welford & Armstrong*. \$2.25.
- What is Art; or, Art Theories and Methods concisely stated. S. G. W. Benjamin. Boston. 8vo. *Lockwood, Brooks & Co.* \$0.75.
- Arts, the Anatomy and Philosophy of Expression, as connected with the face—, Charles Bell. New York. 12mo, illus. *Scribner, Welford & Armstrong*. \$2.00.
- Artillery, Elements of Field—, designed for the use of Infantry and Cavalry Officers. H. Knollys. London. 8vo. *Blackwoods*. (Van Nostrand. New York.) \$3.75.
- History of the Organization, Equipment, and War Services of the Regiment of Bengal Artillery, compiled from published Works, official Records, and various private Sources. F. W. Stubbs. London. 8vo, illus., 2 vol. *Henry S. King*. 32s.
- Primer for Garrison—, M. F. Downes. London. 12mo. *Clowes*. 2s.
- Astronomy, Handbook of descriptive—, G. F. Chambers. 3d ed. London. 8vo, illus. *Macmillan*. (New York.) 28s.
- Belting, a Treatise on the Use of—, for the Transmission of Power. John H. Cooper. Philadelphia. 8vo, illus. *Claston, Remsen & Haffelfinger*. (Announcement.)
- Bird Preserver, the British— or, how to skin, stuff, and mount Birds and Animals; with a Chapter on their Localities, Habits, and how to obtain them; also Instructions on Moth and Butterfly Catching, Setting and Preserving, with practical Illustrations. Samuel Wood. London. 12mo, illus. *Warne*. 1s.
- Boiler Incrustation and Corrosion. F. J. Rowan. (Van Nostrand's Science Series, London reprint.) New York. 12mo, illus. *Van Nostrand*. \$0.50.
- Botany. Flowers, and the Plants they grow on. U. Ware. Clifton. 12mo. (*Kent, London*). 5s.
- Text-Book of structural and physiological Botany. O. W. Thome. Trans. and ed. by Alfred W. Bennett. (Text-Book of Science.) London. 12mo, illus. *Longmans*. 6s.
- Bridges. Works in Iron. Bridge and Roof Structures, with Examples of Structures made and erected by Andrew Handyside & Co.; also Vocabulary of technical Terms used in the Design, Manufacture, and Commerce of Iron Structures.—English, French, German, Italian, Spanish. Ewing Matheson. 2d ed. London. 4to, illus. *Spots*. (New York.) \$6.00.
- Builders' and Contractors' Price Book for 1877. Lockwood's—rev. and ed. by Francis T. W. Miller. London. 12mo. *Crosby & Lockwood*. 4s.
- Price Book for 1877. Laxton's. London. 12mo. *Kelly*. 4s.
- Prices. 1877. Skyring's. London. 8vo. *Simpkin*. 4s.
- Calculus, an elementary Treatise on the differential Calculus, containing the Theory of Plane Curves, with numerous Examples. Benj. Williamson. 3d ed., rev. and enl. London. 12mo. (*Van Nostrand, New York*). \$5.25.
- Catalogue, the London—, of Periodicals, Newspapers, &c., for 1877. London. 8vo. *Longmans*. 1s.
- Chemia Coartata; or, the Key to modern Chemistry, adapted especially to the Wants of Students preparing for Examinations, Persons who have learned the Old Notation and wish to learn the modern System, &c. A. H. Kollmyer. Philadelphia. 12mo. (*Van Nostrand, New York*). \$2.25.
- Chemical Problems, a Series—for Use in Colleges and Schools. T. E. Thorpe, with Preface by Prof. Roscoe. 5th ed. London. 18mo. *Macmillan*. (New York.) \$1.00.
- Chemistry, a Primer of—, including Analysis. Arthur Vacher. London. 12mo. *Churchill*. 1s.
- Clock and Watch Makers' Manual, new and complete—comprising Descriptions of the various Gears, Escapements and Compensations now in Use in French, Swiss and English Clocks and Watches, Patents, Tools, &c., with Directions for Cleaning and Repairing. Comp. from the French, with an Appendix containing a History of Clock and Watch Making in America. Mary L. Booth. New ed. New York. 12mo, illus. *Wiley & Sons*. \$2.00.
- Commerce. Dictionary, practical, theoretical, and historical, of—and commercial Navigation. J. R. McCulloch, with Biographical Notice of the Editor. New ed., rev. and cor., Supplements being added to show the Progress of British commercial Legislation down to the present Time. London. Ed. by Hugh G. Reid. 8vo. *Longmans*. 63s.
- Commercial Knowledge, a Guide to—containing an Explanation of Terms and Practices in daily Use in the Counting-house, Bank, Warehouse, &c. B. Bannister Turner. London. 12mo. *Stewart*. 1s. 6d.
- Cyclopadia. Appleton's Annual—, for 1876, a Record of the Day. New York. 8vo, illus. (Announcement.)
- Drawing. Technical Drawing and Design for Students of Architecture and Building. Part II: ornamental Drawing in elementary Designs, and detailed Examples of Architectural Designs in various Styles. London. 4to, illus. *Collins*. 1s. 6d.
- Electricity. Application of—, to Railway Working. W. Langdon. London. *Macmillan*. (New York. Announcement.)
- Elements of Magnetism and—, J. Angell. ed. London. 12mo, illus. *Collins*. 1s. 6d.
- Lessons in—at the Royal Institution, 1875-76. John Tyndall. London. 12mo, illus. (*Appletons, New York*). \$1.00.
- Engineering. Manual of elementary Field—, (British Government Publication.) London. 8vo. 1s. 6d.
- Progress of civil and mechanical—and Shipbuilding. Ed. by Smith, Noble and Smith. Div. 1. London. 4to, illus. *Longmans*. 10s. 6d.
- Weisbach's Mechanics of—, Applied Mechanics, containing Strength of Materials, Arches, Foundations, Hydraulics, Steam Engine and other prime Movers, etc., transl. from the last German ed. New York. 8vo. *Wiley & Sons*. (Announcement.)
- Engineers, Information for colonial—, Ed. by J. T. Hurst. No. 2. Southern Africa,

- including Cape Colony, Natal and the Dutch Republics. Henry Hill. London. 8vo, illus. *Spons.* (New York.) \$1.50.
- Foliage, Art—for Sculpture and Decoration. Second Series. Jas. K. Colling. Part I. London. 4to, illus. (*Van Nostrand, New York.*) \$4.50.
- Force. What is Vital Force? or, a short and comprehensive Sketch, including vital Physics, Animal Morphology and Epidemics; to which is added an Appendix upon Geology, is the detrital Theory of Geology tenable? Richard F. Battye. London. 8vo. *Trubner.* 7s. 6d.
- Fossils, the American Palaeozoic—, S. A. Miller. Cincinnati. 8vo. *Miller.* (Announcement.) \$3.00.
- Graphical Statics, Elements of—, and their Application to framed Structures, etc. Cranes; Bridge, Roof, and Suspension Trusses; Braced and Stone Arches; Pivot and Draw Spans; continuous Girders, etc. A. J. Du Bois. 2 vols. 2d ed., rev. and partly rewritten. New York. 8vo, illus. *Wiley & Sons.* \$5.00.
- Hand-Railing. Supplement to Lessons on— Robert Riddell. Philadelphia. 4to, illus. *Claxton, Remsen & Haffelfinger.* \$3.00.
- Hydro-Mechanics, a Treatise on— W. H. Besant. 3d ed. 8vo. London. *Bell & Sons.* 10s. 6d.
- Iron and Steel, Strength and Determination of the Dimensions of Structures of—, with Reference to the latest Investigations; an elementary Appendix to all Text-Books upon Iron and Steel Construction. Jacob J. Weyrauch. Trans. by A. J. Du Bois. An Appendix by R. H. Thurston. New York. 8vo, illus. *Wiley & Sons.* \$1.00.
- Strength and Calculation of Dimensions of Iron and Steel Constructions, with Reference to latest Experiments. Trans. from the German of J. J. Weyrauch. by Mansfield Merriam. New York. 8vo, illus. *Van Nostrand.* \$1.00.
- Life on the Earth, the Succession of—, W. C. Williamson. (Manchester Science Lectures.) London. 12mo. *Macmillan.* (New York.) 6s.
- Machine Designs, the Elements of—, an Introduction to the Principles which determine the Arrangement and Proportions of the Parts of Machines, and a Collection of Rules for Machine Design. W. Cawthorne Unwin. (Text Books of Science.) London. 12mo. (*Van Nostrand.* New York.) \$1.50.
- Man, the Races of—, and their geographical Distribution, from the German of Oscar Peschel. New York. 12mo. *Appletons.* \$2.25.
- Manufacturing Industries, British—, Ed. by G. P. Bevan. Hosiery and Lace, by W. Felkin; Carpets, by Christopher Dresser; Dyeing and Bleaching, by T. Sims. 1 Vol. Pottery, by L. Arnoux; Glass and Silicates, by Prof. Barff; Furniture and Woodwork, by J. H. Pollen. 1 Vol. 2d ed. London. 12mo, illus, *Stanford.* (*Van Nostrand.* New York.) Each \$1.75.
- Maritime Warfare. Thomas G. Bowles. London. 8vo. *Ridgway.* 5s.
- Mechanic, the amateur—, a practical Handbook, describing the different Tools required in the Workshop, their Uses, and how to use Them; also Examples of different Kinds of Work. Arthur H. C. Hobson. London. 12mo, illus. *Longmans.*
- Metal Work, illustrating the chief Processes of—, applied by the Goldsmith, Silversmith, Jeweller, and Art Workmen, in Brass, Copper, Iron, Steel, Bronze or other Metal. In 40 parts. Ed. by G. W. Yap. Part I. London. 4to, illus. *Virtue.* 1s.
- Microscope, a Course of practical Histology: being an Introduction to the Use of the Microscope. Edward Albert Schafer. (English Reprint.) Philadelphia. 12mo, illus. *Lea.* (Announcement.) \$2.00.
- Mining, Lectures on— delivered at the School of Mines, Paris, by J. Callon, trans. by C. L. Neve Foster and W. Galloway. 3 Vols. Vol. I. 8vo, Text. 40 Plates. London. *Duleau.* (*Van Nostrand, New York.*) \$13.00.
- Machinery. A descriptive Treatise on the Machinery, Tools, and other Appliances used in Mining. George G. Andre. (To be completed in 12 monthly parts.) Part I. London. 4to, illus. *Spons.* (New York.) \$2.00.
- Natural Philosophy, a Course of—, R. Wormell. 5th ed. London. 12mo, illus. *Groombridge.*
- for Beginners, with numerous Examples. I. Todhunter. Part I. The Properties of Solid and Fluid Bodies. London. 16mo, illus. *Macmillan.* (New York.) \$1.50.
- Navigation; the Port of Refuge, or Advice and Instructions to the Master Mariner. &c. Manley Hopkins. 2d ed. London. 8vo. *Henry S. King.* 6s.
- Photography, a History and Handbook of—, trans. from the French by G. Tissandier. Ed. by J. Thomson. (English Reprint.) New York. 12mo, illus. (*Van Nostrand.*) \$2.50.
- Physical Geography, elementary Lessons in—, Archibald Geikie. 18mo, illus. *Macmillan.* (New York. Announcement.)
- Political Economy, Essay on—, Frederick Bastiat. English translation, rev., with Notes, by David A. Wells. New York. 12mo. *Putnam.* \$1.25.
- Porcelain Painting, a Guide to—, S. T. Whiteford. London. 12mo, illus. *Rowney.* 2s. 6d.
- Sanitary. A Hand-book of Hygiene and Sanitary Science. George Wilson. 3d ed., enl. Philadelphia. 12mo. (*Van Nostrand, New York.*) \$3.50.
- Silver Coins of England arranged and described. E. Hawkins. 2d ed., with alterations and additions, by R. L. Kenyon. London. 8vo, illus. *Quaritch.* 36s.
- Sines, Haversines' natural and logarithmic —, used in Computing lunar Distances for the Nautical Almanac, ed. by Maj. Gen. Hannyington. (British Government Publication.) London. 8vo. 21s.
- Slide Rule, Hand-Book of—, showing its Applicability to Arithmetic and Mensuration, with numerous Examples and useful Tables. W. H. Bayley. Rev. ed. London. 12mo. (*Van Nostrand, New York.*) \$2.50.
- Speculation, Descartes and English Speculation; the Influence of Descartes on metaphysical Speculation in England, being a Degree Thesis. W. Cunningham. London. 8vo. *Macmillan* (New York.) \$3.00.
- Star Gazing: past and present. Lectures delivered at the Royal Institute by J. N. Lockyer, with Notes and Additions by G. M. Seabroke. London. 8vo, illus. *Macmillan* (New York. Announcement.)

Steam Engine, a few Notes on the portable —, with an Account of its Construction and general Adaptation. John Head. London. 8vo, illus. *Spens* (New York). \$0.80.

—, a practical Treatise on the —, containing Plans and Arrangements of Details for fixed Steam Engines, with Essays on the Principles involved in Design and Construction. Arthur Rigg. (In 12 monthly Parts.) Parts I, II, III. London. 4to, illus. *Spens* (New York). Each, \$1.25.

Telegraph Engineers, Journal of the Society of —, including original Communications on Telegraphy and Electrical Science. Ed. by Frank Bolton and J. Sivewright. Nos. 13, 14. London. 8vo, illus. *Spens* (New York). \$2.00.

Wax Flowers, a Course of Lessons in Model ing —, designed for Beginners. Florence I. Duncan. Philadelphia. 12mo, illus. *Lippincott*. \$1.00.

Weighing and Measuring, the Science of —. H.W. Chisholm. (Nature Series). London. 12mo, illus. *Macmillan*. (New York. Announcement.)

Weaving, a practical Treatise on the Construction of the Loom and the Art of Weaving. Alex. Brown. rev. and enl. ed. London. 12mo, illus. (Van Nostrand, New York.) \$1.75.

Wire Ropes, Transmission of Power by —. Albert W. Stahl. (Van Nostrand's Science Series.) 18mo, illus. *Van Nostrand*, New York. \$0.50.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: regular meetings, when ballots for members will be canvassed and other business done, Wednesday, May 2d, June 6th, and July 4th; and stated meetings, for consideration of professional topics and enjoyment of social intercourse, Wednesday, May 16th and June 20th —each at 8 o'clock P.M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held May 2d, June 6th and July 4th, at 3 o'clock P.M.

PAPERS HAVE BEEN RECEIVED for presentation to the Society since the last announcement, as follows:

"Levees, as a System of reclaiming low Lands."

Discussion—J. F. Flagg. Feb. 13th, 1877.

"The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fires."

Julius H. Streidinger—April 4, 1877.

"Failure of the Ashtabula Bridge."

Discussions—Squire Whipple, Alfred P. Boller. April ..., 1877.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th, next. The conditions of award are set forth in the Code of Rules, herewith published; a copy will be furnished to members upon application.

ADDITIONS TO LIBRARY AND MUSEUM, to contain acknowledgments of contributions to the Library, through the Centennial Commission of the Society (referred to, in Transactions, Vol. VI, page 59), are again laid over, to appear in Proceedings of May.

THE ROOMS OF THE SOCIETY, after May 1st, will be at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows:

On books, pamphlets, periodicals, maps and corrected proof sheets, one cent per two ounces; on photographs, lithographs, and engravings, one cent per ounce; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, three cents per half ounce. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with once or twice the deficiency, according to class; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

LIST OF MEMBERS.

ADDITIONS.

ADDITIONS.		Date of Election.
DUN, JAMES.....	North Springfield, Mo.....	June 7, 1876.
DURHAM, C. WHEELER.....	Civil Eng., Chicago, Ill.....	April 4, 1877-
ENDICOTT, MORDECAI T.....	U. S. Navy, New London, Conn.....	" " "
GODWIN, BRYANT.....	Res. Eng., N. Y. State Canals, 551 Broadway, Albany, N. Y.....	" " "
HARDY, ARTHUR S. [A.]...	Prof. Civ. Eng., Chandler Sci. Dept., Dartmouth College, Hanover, N. H.	" " "
KNAPP, GEORGE O. [J.]....	Civil Eng., Hartford, Conn.....	" " "
McDOWELL, NATHAN M....	City Eng., Alleghany City, Pa.....	" " "

CHANGES AND CORRECTIONS.

BOGART, JOHN.....Sup'g'g Eng., Dept. Public Parks, 42 West 26th st.
New York.

BROWN, CHARLES O.....Eng. Passaic Rolling Mill Co., 130 Chambers st.
New York.

BURR, WILLIAM H.....50 Second st., Troy, N. Y.

CHITTENDEN, SAMUEL H....East River, Conn.

CLARK, JACOB M.....Eng. C. R. R. of N. J., 119 Liberty st., New York.

DODGE, RICHARD D.....58 Clark st., Brooklyn, N. Y.

DU BARRY, EDMUND L.....205 Hoffman st., Baltimore, Md.

GOULD, JAMES P.....Eng. U. & D. and R. & C. R.R., Rondout, N. Y.

HOLLEY, ALEXANDER L.....56 Broadway, New York.

LAFON, THOMAS.....Newark (Knox Co.), Mo.

MCGEE, JOHN.....Steubenville, O.

MOORE, JAMES.....Sup't, C. R. R. of N. J., Elizabeth, N. J.

NADER, JOHN.....City Eng., Madison, Wis.

NICHOLS, OTHNIEL F.....112 Cambridge Place, Brooklyn, N.Y.

OPDYKE, STACY B., JR.....Ass't Eng. P. R.R., Lewiston, Pa.

PROUT, HENRY G.....Lieut. Col. of Engs., Army of the Khedive, Vice
Governor General of the Soudan, Egypt.

READ, ROBERT L.....Chief Eng., U. R.R., Transfer and Stock Yard Co.,
Indianapolis, Ind.

SEWALL, JOSEPH.....City Eng., St. Paul, Minn.

SHEDD, J. HERBERT.....65 Westminster st., Providence, R. I.

VAN WINKLE, EDGAR B...."Rockingham," 56th st. and Broadway, New York.

WARD, CHARLES D.....39 Hudson st., Jersey City, N. J.

WELLMAN, DAVID W.....Civil Eng., St. Paul, Minn.

DEATHS.

GRAIN, WILLIAM.....	Fergus, Ontario.....	Jan. 10, 1877.
KIRKWOOD, JAMES P.....	Brooklyn, N. Y.....	April 22, "

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. May, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 24TH—26TH, 1877.—THE NINTH ANNUAL CONVENTION.—[Report of the proceedings has not yet come to hand.]

MAY 2D, 1877.—A quorum not being present, the regular meeting was adjourned.

MAY 11TH, 1877.—An adjourned regular meeting was held at eight o'clock P. M.

A paper by Edward P. North, C. E., of Fordham, N. Y., on "Brush Dams," was read by him and briefly discussed.

Mr. Charles E. Emery, Associate Secretary of the Ninth Annual Convention, held in New Orleans, made an informal report of the proceedings.

The death, on April 22d, of James P. Kirkwood, C. E., late of Brooklyn, N. Y., one of the first Members of the Society, a Director from its organization until November 6th, 1867, when he was elected President—the second incumbent of that office, which position he resigned June 16th, 1868, was announced, and it was moved that a committee be appointed to prepare a memoir of the life and professional services of the deceased.*

OF THE BOARD OF DIRECTION.

MAY 2D AND 11TH, 1877.—A quorum not being present, the stated meeting was adjourned.

* The Committee appointed, consists of Alfred W. Craven, Julius W. Adams, William E. Worthen and James B. Francis.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

WATER SUPPLY FROM BRONX RIVER.—The following letter, written by Gen. Philip Schuyler, in answer to Col. Richard Varick, the Mayor of New York City, in the year 1799, asking him for his opinion on Dr. Brown's plan for supplying the city with water from the Bronx River, was presented by John Schuyler, C. E., of New York, and read at the meeting of the Society, April 18th, 1877. (It is printed as written.)

ALBANY, Jan. 29, 1799.

Dear Sir,

Mr. Briggs was so good as to deliver me two copies of Dr. Brown's Memoirs as from you.

I have read the Memoirs with as much attention as I am capable of.

Supposing the water of the Bronx sufficient for the purposes detailed in the Memoirs, the mode of conducting it to the City appears to me liable to such strong objections, that if I was a member of your corporation, or a director of an associate company engaged to convey that water to the City, I should not dare to venture on a plan so expensive, and so exposed, as I think, to danger.

Permit me, in confidence (for I wish not a contest with any person from whom I may differ in opinion), to mention some of the objections with which my mind is impressed.

The Doctor proposes, by means of a Hydraulic Machine, to raise the water to a height of 80 feet above the level of Harlem River, to gain a sufficient fall from thence to a reservoir at the city, and he estimated the fall so gained at 40 feet. This would, indeed, be the case if the tubes by which the water is conveyed could be so laid as to maintain a continual uninterrupted inclination from the Hydraulic Machine to the reservoir, but from the little I know of the intermediate country, it appears to me that the track of the aqueduct or tubes will pass thro' Ravines and over Hills whose summit level will be little short, if not exceed the difference of level between the 80 feet to which the water is to be raised, and the point where it is to be delivered. Let us suppose that the apex of such summit is only 10 feet below the level of the 80 feet to which the water is to be raised by the Hydraulic Machine, then it is perfectly evident that to such apex there would only be 10 feet fall from the Machine; and if such apex was four or five miles from the reser-

voir, a tube of six-inch bore, instead of delivering 300 000 Gallons per day, would not deliver more than one quarter that quantity; and if 300 000 Gallons be requisite, it would require four tubes of a six-inch bore; and, consequently, the expense would be greatly increased. But there may be several hills with intermediate valleys, and at the summit of each there must be an air-pipe to discharge the air which, entering the tubes with the water, will collect at such apex, and if not frequently discharged, will so wire-draw the water that little will pass. This will form a considerable item in the first expense, and be an annual one.

If the tubes in any intermediate valley should lay 70 or 80 feet below the height to which the water is raised by the Hydraulic Machine, the pressure on the tubes in those valleys will be so great as to require not only the very largest, but the most solid kind of timber to prevent their bursting. But it is hardly possible to guard against such accidents, as the London water-works amply evince; and so expensive is the charge of those repairs, that in that City they are in the practice of substituting iron cylinders, from time to time, as the wooden ones give way; indeed, the tubes which convey the water from the Chelsea Steam Engine to Hyde Park are all of cast iron.

If more than one string of tubes is indispensable, and even if they should not exceed two, yet the canal in which they must be laid would be nearly as wide as a canal to convey the whole of the water of the Bronx from the point where the Doctor proposes to take it to the reservoir in the City. Whether the water can be conveyed in an open canal or not, can only be determined by actual survey. If it could, I hesitate not to say, that it would be not only the most eligible, but probably, in the first instance, least expensive, and certainly not liable to such an annual heavy charge as must inevitably result from an Hydraulic Machine and subterraneous wooden tubes. But, should the first cost of an open canal be double that of Tubes, yet the certainty of supply and the trifling annual charge, would, in my estimation, render it incomparably more eligible than the other.

The Doctor has made an estimate of the expense. Estimates, nine times out of ten, are so erroneous, that I have little faith in any, even if previous surveys are made; but when

such surveys are not made, I reject them as erroneous. But why make estimates? The question is, is the work indispensable? If so it must be done be the cost what it may; only take care that it be done with proper economy and be well done. It will be so if Mr. Weston conducts the work. The corporation may insist on an estimate, he may give one; but if the work is to be performed in the manner proposed by the Doctor, and if Mr. Weston's estimate should not treble that of the Doctor's, I should conclude that his usual prudence had forsaken him. I mention this not to discourage the corporation from the attempt, but to guard them against setting their hopes beyond the bounds of probability, from which disappointment will always result.

Should it be found impracticable to convey the water of the Bronx to the City of New York, I do not think the idea of a supply from the "Colloc" or "Fresh Water Pond" ought to be abandoned, for if there should be a sufficiency there, the objections stated in the Doctor's memoirs to its use from the filth and drainings from vaults, might certainly be obviated by well-constructed embankments around the pond, with back drains to carry off extraneous water and filth, nor will it be at-

tended with any considerable expense to determine the quantity of water which the Pond will afford in twenty-four hours. The injury sustained by the distressing calamity with which your city has been recently afflicted, is not confined to the residents therein. It extends to and is felt in every part of the State. Impressed as I am with this truth, and convinced that Legislative aid should be interposed, to prevent, if possible, a repetition of such distress, I have most earnestly recommended to many of the Legislature to appropriate the duty on "Vendues" to this object and to the relief of your City from its heavy burdens. But my hopes on this head are slender, as the members of the Legislature do not seem to have duly appreciated the extent of the injury which the State sustains from any calamity in the Metropolis.

I therefore wish that some able pen should state it in detail, and publish it in the papers printed in this City, to draw the attention of the Legislature.

I am, dear sir, with
great regard and esteem,
your obedient servant.

PH. SCHUYLER.

RICHARD VARICK, Esq.

THE CENTENNIAL COMMISSION OF THE SOCIETY.

REPORT ON AWARDS.—The following certificate, duly signed and sealed, has been received from the International Exhibition; "The United States Centennial Commission has examined the reports of the Judges, and accepted the following reasons, and decreed an award in conformity therewith."

Report on Awards.—Product.—Drawings, photographs, models, manuscripts and various publications, illustrating the works of the Society and the progress of Civil Engineering."

"Name and Address of Exhibitor."

"American Society of Civil Engineers, New York."

"The undersigned having examined the products herein described, respectfully recommends the same to the United States Centennial Commission for award, for the following reasons, viz.:-

"For a very large and important exhibition, and for the great service rendered by the Society to the art and science of Engineering."

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Alcohol as a Food and Medicine, a Paper from the Transactions of the International Medical Congress, at Philadelphia, September, 1876. Ezra M. Hunt. New York. 12mo. National Temperance Soc. \$0.60.

Alphabets, Draughtsman's—A Series of plain and ornamental Alphabets, designed especially for Engineers, Architects, Draughtsmen, Engravers, Painters, &c. Hermann

Esser. 2d ed. New York. Folio, illus. Bicknell. \$2.00.

—, Examples of modern—plain and ornamental. F. Delamotte. 6th ed. London. 4to. Lockwood. 4s.

—, ornamental and fancy—Monograms and Titles. M. Woodward. In 20 parts. New York. 4to, illus. Parts I.-IV. Judd. Each \$0.50.

- Architect, national—. M. Woodward. Vol. 2. In 24 parts. New York. 4to, illus. Part I. *Judd*. \$0.50.
- Architecture, illustrated Papers on Church—E. Sharpe. No. 3. London. 4to, illus. *Spons* (New York). 10s.
- Art. The Mythology of Greece and Rome, with special Reference to its Use in Art. O. Seemann, ed. by G. H. Bianchi. London. 8vo, illus. *M. Ward*. 3s. 6d.
- , the Theory of—and some Objections to Utilitarianism. Guy D. Daly. New York. 8vo. *Appletons*. \$0.25.
- Astronomy. The Window Observatory. H. King. London. 12mo. *Lockwood*. 1s.
- Balance Spring (the) a practical Treatise on—including Making, Fitting, Adjusting, Isochronism and Positions, and Rating; also the Adjustment for Heat and Cold. By "Excelsior." New York. 8vo, illus. *D. H. Hopkinson*. \$3.50.
- Bridge. The Ashtabula Disaster. Stephen D. Peet. Cleveland. 12mo, illus. *Goodman*. \$1.75.
- Camp. How to Camp Out. John M. Gould. New York. 12mo, illus. *Scribner*. \$1.00.
- Chemical Analysis. Tables for systematic Qualitative Chemical Analysis. John H. Snively. Nashville. 8vo. (*Van Nostrand*, New York). \$1.00.
- Chemistry. Elements of inorganic—. J. C. Buckmaster. Part I. Elementary Step. 13th ed. London. 12mo, illus. *Simpkin*. 1s. 6d.
- , Manual of—theoretical and practical. H. Fownes. 12th ed., rev. and cor. by Henry Watts. Vol. I., physical and inorganic Chemistry. London. 8vo, illus. *Churchill*. 8s. 6d.
- First Grade Freehand Test Papers, Ledsham's, 48 sheets, 8 varieties. London. 8vo. *Simpkin*. Each 1s. 3d.
- Principles of theoretical—, with special Reference to the Constitution of chemical Compounds. Ira Remsen. Philadelphia. 12mo, illus. *Lea*. \$1.50.
- technical—. Prof. Roscoe. (Science Lectures at South Kensington.) London. 12mo, illus. *Macmillan* (New York). 6d.
- Coal Mines of the western Coast of the United States. W. A. Goodyear. San Francisco. 12mo. *Bancroft* (Announcement).
- Cyclopædia (Domestic), of practical Information, principally written or revised by Calvert Vaux and Thomas Wisedell. Locating, Building and Repairing; Lewis Leeds, Warming and Ventilation; George L. Waring, Drainage, the Garden and Dairy; George Fletcher Babb, Decoration as applied to Walls, Floors and Furniture; Elizabeth S. Miller and Giuseppe Rudmani, Cooking and domestic Management; Austin Flint, Dietetics and alcoholic Beverages; Abraham Jacobi, Diseases and Hygiene of Children; William T. Lusk, general Medicine; S. G. Perry, the Teeth; Elwin Waller, Domestic Chemistry (Disinfecting, Cleaning, Dyeing, etc.); Leslie Pell-Clark, the Horæ; Johnson T. Platt, Business Forms and legal Rules. Ed. by Todd S. Goodholme. New York. 8vo, illus. *Holt*. \$5.
- the royal masonic— of History, Rites, Symbolism, and Biography, containing about 3 000 Subjects, with numerous original archeological Articles on Topics not before treated in a similar Work. Ed. by Kenneth R. H. Mackenzie. New York. 8vo. *Bouton*. \$7.
- Designs for Monuments. Joseph Banzer. New York. Folio, illus. *Bicknell*. \$8.
- new and selected— for the First Saw. M. Woodward. In 12 parts. New York. 4to, illus. Part I. *Judd*. \$0.50.
- Drawing Book. J. D. Harding. New ed. London. 4to, illus. *Kent*. 15s.
- Studies, artistic—. M. Woodward. In 20 parts. New York. 4to, illus. Part I. *Judd*. \$0.50.
- Dust, Incidents in the Biography of—. H. P. Malet. London. 8vo. *Trubner*. 6s.
- Earth, Ancient Life-History of—a comprehensive Outline of the Principles and leading Facts of paleontological Science. H. Alleyne Nicholson. London. 8vo. *Blackwoods*. 10s. 6d.
- Electricity, elementary Lectures on—, with Notes on the Instruments and Apparatus in Use in the Telegraph Troop. Royal Engineers (British Government Publication). London. 8vo, illus. 1s. 9d.
- Fires, their Causes, Prevention and Extinction, combining also a Guide to Agents respecting Insurance against Loss by Fire, and containing Information as to the Construction of Buildings, special Features of manufacturing Hazards, Writing of Policies, Adjustment of Losses, etc., etc. F. C. Moore. New York. 16mo. *Kingsland*. \$2 00.
- Fruits, how to raise—; or, Fruit Culture for the Million. a Handbook of Fruit Culture, being a Guide to the Cultivation and Management of Fruit Trees, including Grapes and small Fruits, with condensed Descriptions of many of the best and most popular Varieties. Thomas Gregg. New York. 12mo, illus. *Wells*. \$1.00.
- Geological Survey of California. J. D. Whitney. Vol. 1. Polypetalæ.—by W. H. Brewer and Sereno Watson, Ganoptalæ. by Asa Gray. Cambridge. 4to, illus.
- of Ireland, explanatory Memoir to the Map 83 and 84, accompanying Sheets 21, 28, 29. of Publication.) (British Government.) London. 2 Vols. Each 3s.
- Geology. Elements of agricultural— William K. Kedzie. Cincinnati. 12mo. *Van Antwerp, Bragg & Co.* (Announcement.) \$0.50.
- Geometrical Methods. Treatise on some new—. James Booth. Vol. II. London. 8vo. *Longmans*. 18s.
- Geometry, elementary—, Plane, Solid and Spherical. William F. Bradbury. Boston. 12mo, illus. *Thompson, Brown & Co.* \$1.10.
- Elements of—. G. M. Searle. With Appendix containing Problems and additional Propositions. New York. 8vo. *Wiley & Sons*. \$1.50.
- Land, Contracts for the Sale of—, before Conveyance. E. Coppee Mitchell. Philadelphia. 8vo. *Rees, Welsh & Co.* \$1.25.
- Light, Six Lectures on—, delivered in America in 1872-73. John Tyndall. 2d ed. New York. 12mo, illus. *Appletons*. \$1.50.
- Lightning Protection, a practical Treatise on—, Henry W. Spang. Philadelphia. 12mo, illus. *Claxton, Remson & Haffelfinger*. (Announcement.)
- Mechanic's amateur Handicraft, containing Information on Lens and Specula Grinding, Soldering and Brazing Emery Wheels,

scientific Tool Grinding, Lathes and Lathe-work, Filing, Planing, Drilling, Boring, and a plain Guide to the Use of such Tools of Construction and Ornamentation as are commonly found in the Workshop of the amateur Mechanic. London. 12mo, illus. Kent. 2s.

Mechanical Engineering. Manual of Rules, Tables and Data for —, based on the most recent Investigations of constant use in Calculations and Estimates. David Kinnear Clark. London. 8vo, illus. Van Nostrand. (New York.) \$7.50.

Metric System of Weights and Measures. J. Pickering Putnam. 2d ed., new and enl. Boston. 8vo. Am. Metric Bureau. \$1.00.

Meteorological Data, Remarks to accompany the monthly Charts of — for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S. Latitudes, and extend from 10° to 40° S. W. Longitude, ending with the best Routes across the Equator. (British Government Publication.) London. Folio, illus. 24s.

Observations, on the Weather at Cannes during the Season 1875-6, a Report made at Cannes from November 1, 1875, to April 30, 1876, with Remarks. London. 8vo. Longmans. 1s.

Microscope, how to choose — by a Demonstrator. London. 8vo, illus. Hardwicke and Bogue. 1s.

Mineralogy, a Text-Book of —, after the Plan and with the Co-operation of James D. Dana. Embracing a full Treatise upon Crystallography and Physical Mineralogy. Edward S. Dana. New York. 8vo, illus. Wiley & Sons. \$5.00.

Mines, Minerals and Mining Water Rights. the Law of —, a Collection of select and leading Cases on Mines, Minerals and Mining Water Rights, with Notes. George A. Blanchard and Edward P. Weeks. San Francisco. 8vo. Whitney & Co. \$7.50.

Mnemonics; or a System of Aids to Memory. William Begg. Cincinnati. 12mo. Chase & Holt. \$1.50.

Nomisma, or "Legal Tender." Henri Cernuschi. New York. 12mo, Appletons. \$1.25.

Newspaper Directory and Advertiser's Handbook for 1877; comprising a complete List of Newspapers and other Periodicals published in the United States and British America. New York. 8vo, illus. Petten-gill. \$1.00.

Numismatics, Essays on oriental —. Stanley J. Poole. 2d series. London. 8vo. Trubner. 3s.

Oceanic Explorations, Remarks on the recent —, and the current-creating Action of Vis-inertia in the Ocean. W. J. Jordan. London. 8vo. Hardwicke & Bogue. 4s.

Organ, an Outline of the Structure of the Pipe Organ, designed for the general Information of Organists, Church Committees, and musical Students. William H. Clarke. Chicago. 8vo, illus. Clarke & Co. \$1.50.

Painting, a Handbook to the Practice of China Painting. John C. L. Sparkes. Boston. Tilton & Co. (Announcement.)

Parliamentary Practice, Manual of —, Luther S. Cushing. Rev. by Edward L. Cushing. Boston. 16mo. Thompson. \$0.75.

Perfumery, a complete practical Treatise on —, R. S. Christiani. Philadelphia. 8vo. Baird. (Announcement.)

Physical Geography; or the terraqueous Globe and its Phenomena. W. D. Cooley. London. 8vo, illus. (Van Nostrand. New York.) \$6.25.

— Sciences, the Connection of Physical —, Mary Somerville. 10th ed., cor. and rev. by Arabella B. Buckley. London. 8vo. Murray. 9s.

Plants, cultivated: their Propagation and Improvement. F. W. Burbidge. London. 8vo. Blackwood. 12s. 6d.

— Forage —, and their economic Conservation by the new System of "Eustilage." Thomas Christy. London. 8vo. Christy. 1s.

Railway Disbursements. Marshall M. Kirkman. New York. 12mo. Railroad Gazette. \$2.00.

— Manual, Shareholder's Guide and Directory, Bradshaw's, 1877. London. 8vo. W. J. Adams. 12s.

— Reports, American; a Collection of all reported Decisions relating to Railways. Herbert A. Shipman. Vol. VIII. New York. 8vo. Cockerell. \$6.00.

Railways of New South Wales. Report on their Construction and Operation from 1872 to 1875, inclusive. John Rae. Sydney, folio. (Van Nostrand. New York.)

Seaman's, the Young Seaman's Manual and Riggers' Guide. C. Burney. 4th ed., rev. and cor. and adapted to the Use of Royal Navy and mercantile Marine. London. 8vo, illus. Trubner. 7s. 6d.

Science and Industry, annual Record of — for 1876. Ed. by Spencer F. Baird, with Assistance of eminent Men of Science. New York. 12mo. Harper's. \$2.00.

— Manchester Science Lectures for the People. 8th Series, 1876-7. The Succession of Life on the Earth. 3 Lectures by W. C. Williamson. London. 12mo, illus. Macmillan, (New York.) \$0.25.

— Questions, already set by the Science Department: Animal Physiology, Acoustics, inorganic Chemistry, Magnetism and Electricity, Mathematics. First Stage. London. 12mo. Simpkin. Each 2d.

Social Science, Transactions of the National Association, Liverpool Meeting, 1874. Ed. by C. W. Ryalls. London. 8vo. Longmans. 12s.

Tramway Companies, Manual of — in the United Kingdom, together with Traffic Tables of the principal Companies, and Map of those in London. W. W. Duncan. London. 12mo. Matheson. 2s.

Trigonometry, elementary —, J. Hamlin Smith. New ed., rev. London. 8vo. Livingtons. 4s. 6d.

— Manual of Plane —, James Henchie. London. 12mo. Murby. 1s. 6d.

United States Blue Book, a Register of Offices and Clerkships and other civil Positions under the United States Government, and the Salaries, etc., 1876-77: compiled from the Official Register of the Government. Washington. 16mo. Washington Publishing Co. \$0.50.

Warp Sizing; a practical, theoretical and chemical Treatise. E. Webb. Manchester. 8vo, illus. (Van Nostrand. New York.) \$3.75.

ADDITIONS TO LIBRARY AND MUSEUM.

NOTE.—“Copies for distribution” named in this list, will, in order of receipt, be sent to members who apply, until the supply is exhausted.

DONATIONS ARE ACKNOWLEDGED AS FOLLOWS:

- From F. Althaus, Berlin, Prussia:
International Exhibition at Philadelphia.
(German.)
- From American Iron and Steel Association, Philadelphia, Pa.:
Canadian Reciprocity. Philadelphia.
- From American Metric Bureau, Boston:
The Metric Bulletin. Official Journal of the American Metric Bureau. July, 1876. No. 1. (2 copies.)
- From Argentine Scientific Society, Buenos Ayres, S. A.:
Annals of the Argentine Scientific Society. Parts I, II. Vol. XII. 1876.
- From R. C. Bacot, Jersey City, N. J.:
Geological Survey of New Jersey. Annual Report of State Geologist for 1876. Trenton.
Report of Riparian Commissioners of New Jersey for 1876. Trenton.
- From W. S. Barbour, Cambridge, Mass.:
Annual Report of City Engineer, City of Cambridge, to the City Council, for the year ending November 30, 1876.
Annual Report of the Cambridge Water Board to City Council, with other Documents, for 1876.
Mayor's Address at Organization of City Government, and Annual Reports of City Council.
- From Arthur Beckwith, New York:
Majolica and Fayence, Italian, Sicilian, Majorcan, Hispano-Moresque and Persian. New York.
- From Gen. S. V. Benet, Chief of Ordnance War Department, Washington,
Annual Report of Chief of Ordnance for year ending June 30, 1876. Washington.
- From C. E. Billin, Philadelphia, Pa.
Annual Reports of Secretary of Internal Affairs of Pennsylvania for 1874-5.
Fifteenth Annual Report of Columbia Oil Company, 1876. Pittsburgh, Pa.
Measured Section of the Palaeozoic Formations in Middle Pennsylvania.
Preliminary Report of Mineralogy of Pennsylvania, by F. A. Geuth; with Appendix on Hydro-carbon Compounds, by Samuel P. Sadtler. Harrisburg.
- Special Report on the Petroleum of Pennsylvania; its Production, Transportation, Manufacture and Statistics. Harrisburg.
- From A. D. Briggs, Springfield, Mass.:
Eighth Annual Report of Board of Railroad Commissioners, January, 1877. Boston. (4 copies.)
- From Buff & Berger, Philadelphia, Pa.:
Catalogue of improved Engineering Instruments.
- From G. B. Bulkley, New Rochelle, N. Y.
Bridge Building. S. Whipple. Albany. 1869.
Descriptive Geometry, applied to Fortifications and Stereotomy. D. H. Mahan. New York. 1864.
- Elementary Course of Civil Engineering. D. W. Mahan. New York. 1861.
Elements of descriptive Geometry. C. Davies. New York. 1850.
Elements of practical Hydraulics. S. Downing. London. 1861.
General Theory of Bridge Construction. H. Haupt. New York. 1851.
Introduction to practical Astronomy. E. Loomis. New York. 1871.
Manual of applied Mechanics. W. J. M. Rankine. London. 1870.
Manual of Civil Engineering. W. J. M. Rankine. London. 1857.
Principles and Practice of Statics and Dynamics. T. Baker. London. 1851.
Rudimentary Treatise on Drainage of Towns and Buildings. G. D. Dempsey. London. 1854.
Treatise on plane and spherical Trigonometry. C. W. Hackley. New York. 1860.
Treatise on Well-digging, Boring and Pump-Work. J. G. Swindell. London. 1851.
Useful Formulae, for locating and constructing Railroads. S. Borden. Boston. 1851.
- From G. B. Butler, New York:
Croton Water Supply for the City of New York, an address delivered before the N. Y. Municipal Society, December 21, 1876. New York.
- From Allen Campbell, New York:
Report of Allan Campbell, Commissioner of Public Works, on Rapid Transit. New York. (3 copies.)
Report of Department of Public Works, for Quarter ending December 31st, 1876. New York.
- From Prof. C. F. Chandler, New York:
Court of General Sessions, New York, December, 1876. People vs. D. Schrupf.—Misdemeanor, Adulteration of Milk. Argument of W. P. Prentice.
- From O. Chanute, New York:
Report of Erie Railway Co. for year ending September 30, 1876. (2 copies.)
Report of H. J. Jewett, Receiver of Erie Railway Co. for year ending September 30, 1876. (2 copies.)
- From E. S. Chesbrough, Chicago, Ill.:
Sewerage; its Advantages and Disadvantages, Construction and Maintenance. Boston.
- From Civil Engineers Club of the North West, Chicago, Ill.:
Deep pile Driving in Wisconsin, 1875.
Preliminary Surveys for Texas & Pacific Railway, 1874.
- From H. W. Clarke, Syracuse, N. Y.
Report of Superintendent of Onondaga Salt Springs. Albany. 1877.
- From Claxton, Remsen & Haffelfinger, Philadelphia:
Civil Engineer's Pocket Book. J. C. Trautwine. Rev. ed. Philadelphia.
- From Mrs. C. Collins, Cleveland, O.:
Photographs illustrating Bridges and Structures.

tures on the Lake Shore & Michigan Southern Railway, in bound Portfolio.

From J. J. R. Croes:
Department of Public Parks. Report of the civil and topographical Engineer and the Landscape Architect, accompanying a Plan for local Steam Transit Routes in the 23d and 24th Wards, New York. (Copies for distribution.)

From C. Davis, Alleghany City, Pa.:
Annual Report of the City Engineer of Alleghany City. 1875.

From J. P. Davis, Boston, Mass.:
Annual Report of the City Engineer of Boston for 1876. Boston.

From C. T. Flowers, Columbus, O.:
Report of Joint Committee on the Ashtabula Bridge Disaster. Columbus.
(Also copies from others unknown.)

From C. G. Forshey, New Orleans, La.:
The Route to the Seaboard, the Mississippi River against transcontinental Railroads. New Orleans.

From C. Douglas Fox, London:
Address by James Ashbury, on the Eastern Question, at Brighton. January 30, 1877.

From J. P. Gardner, Albany, N. Y.:
Report of Board of Commissioners of the State Survey for 1876. (Several copies.)

From Gen. G. A. Gillmore, New York:
Foundation of the Washington National Monument. (Eight copies.)

From C. O. Gleim, Cologne, Germany:
Rhenish Railroad Bridge over the Rhine at Rhemshausen. (German.)

From H. S. Goodwin, Bethlehem, Pa.:
Annual Report of Lehigh Valley R. R. Co., January 16, 1877. Philadelphia.

From G. S. Greene, Jr., New York:
Facts relating to Department of Docks, City of New York, and Reasons for its Continuance as a separate Department of city Government. New York. (2 copies.)
Review by the Dock Commission, of Reports made to certain commercial Bodies. New York. (2 copies.)

From I. Ad. Heimecourt, New Orleans:
Project of a Ship Canal between Mississippi River and Gulf of Mexico. 2 vols. New Orleans.

From D. F. Henry, Detroit, Mich.:
Annual Report of Board of Water Commissioners, Detroit, with Reports of Officers for 1876. (3 copies.)

From Prof. J. Henry, Director Smithsonian Institute, Washington, D. C.:
Smithsonian Report for 1875. Washington.

From G. Hornung, Newport, Ky.:
Annual Reports submitted to Board of Councilmen of Newport, Ky., for 1876.

From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington:
Annual Report of Chief of Engineers for year 1876. 3 vols.

Proposals for Building Dam on the Great Kanawha River. W. P. Craighill.
Reports on the following. (Several copies.)

Destruction of Reef at Hallet's Point. John Newton.
Harbor of Refuge at Mill Creek on the Ohio River.

Improvement of the Ohio, Monongahela and Wabash Rivers.

Improvement of the South Pass of the Mississippi River. (Sixth report).

Improvement of Rivers and Harbors in California.

Reconnaissance from Carroll, Montana Territory, to Yellowstone Park and return. W. Ludlow.

Water Line of Transportation from Mouth of St. Mary's River to the Gulf of Mexico. Q. A. Gillmore.

Specifications for Improvement of Rappahannock River, Va.

Statement from Secretary of War concerning Appropriations for Improvement of Rivers and Harbors.

Suggestion relating to Acts for Improvement of Fox and Wisconsin Rivers. D. C. Houston.

From Institution of Civil Engineers, London, England:
Excerpts from Minutes of Proceedings, Session 1876-7, as follows:

Abstracts of Papers in foreign Transactions and Periodicals. (2 numbers).

Chalk Water System. Joseph Lucas. With Abstract of Discussion.

Combustion of refuse vegetable Substances, as straw, Cotton, Stalks and Brushwood, under Steam Boilers. John Head. With Abstract of Discussion.

Conditions of Resistances of Swing Bridges. Jules Gaudard.

History and theoretical Laws of centrifugal Pumps, as supported by Experiment, and their Application to their Design. R. C. Parsons.

Repairs and Renewals of Locomotives. A. McDunnell. With Abstract of Discussion.

The Sewage Question. C. A. Bazalgette. Minutes of Proceedings, with other selected and abstracted Papers. Session 1876-7. Part I.

From Institution of Mechanical Engineers, Birmingham:

General Index, &c., Proceedings 1847-73.

Library Catalogue, 1876.

Proceedings, October, 1876; January, 1877. (2 numbers.)

From Iron and Steel Institute, London:
Journal of the Institute, Proceedings of Leeds Meeting, 1876.

From Capt. W. A. Jeffers, Chief of Ordnance, Bureau U. S. N., Washington:
Report of Chief of Ordnance, 1876.

From J. Kennedy, Montreal, Can.:
Annual Report of Harbor Commissioners of Montreal for 1876. Montreal.

From G. A. Kimball, Somerville, Mass.:
Third Annual Report of the City Engineer of Somerville.

From L. H. Knapp, Buffalo, N. Y.:
Eighth Annual Report of Buffalo City Water Works for 1876.

From C. Latimer, Cleveland, O.:
Meeting of Road Masters of Atlantic & Great Western R. R., October 26, 1876.

From G. P. Low, Jr., Boston, Mass.:
Duty of Pumping Engines. New York. Reports as follows:

Of Chief and Consulting Engineer of the Board of Public Works, Jersey City, 1871.

Of Chief Engineer of Jersey City, 1872.

Of Commissioners of City Works, City of Brooklyn, for 1872.

Of Nassau Water Department, City of Brooklyn, for 1869 and 1871. (2 numbers).

Of Newark Aqueduct Board, 1870.

From Emil Low, Pittsburg, Pa.:
Pittsburg Water Works. Map showing Location of Hilland Avenue, Brilliant Hill Reservoirs and the Pumping Works.

From E. Malezieux, Paris, France:
Maritime Ports of France (French). 8vo. Text with Maps. Paris.

From C. C. Martin, W. H. Paine, F. Collingwood and G. W. McNulty, Brooklyn, N. Y.:
Report of Chief Engineer of New York & Brooklyn Bridge, January, 1877. (A copy for each member).

From W. J. McAlpine, Babylon, N. Y.:
Brief History of Petroleum. (6 copies.)
Reports, bound in 8 volumes, as follows:
Canada—Canals, Public Works, 1855-1873.
Canals, team-power, Gates, Canada & Western Canal.
European Engineers.
Jetties and Levees, Hartley, U. S. Engineers, Eads.
Pumping Engines, Ordnance, Miscellaneous. 1876.
Sewerage, Sanitary Engineering. 1876.
Water Works, Philadelphia, Reports of W. J. McAlpine.
Water Works. 1876.

From W. Metcalf, Pittsburgh, Pa.:
On the Relationship of Structure, Density, and chemical Composition of Steel. (3 copies).

From John Nader, St. Paul, Min.:
Transactions of Wisconsin Academy of Sciences, Arts and Letters, 1875, 1876. Vol. III.

From Charles Paine, Cleveland, Ohio:
Seventh Annual Report of Lake Shore & Michigan Southern Railway Co. 1877.

Meeting of Officers and Employees of Lake Shore & Michigan Southern Railway Co., on Death of Charles Collins, late Chief Engineer, 1877.

State Railroad.—Account rendered of Operations during 1868. Reports presented to the Legislative Chambers by the Minister of Public Roads. Brussels. (French.)

Supreme Court of the United States, November, 1876. Michigan Southern & Northern Indiana R. R. Appellant. Brief for Appellant. Chicago.

From W. H. Paine, Brooklyn, N. Y.:
Niagara Railway Suspension Bridge.

From G. W. Plympton, Brooklyn:
Report of Minister of Public Works for year ending June 30, 1876. Ottawa.

From T. Prosser & Son, New York:
The International Exhibition, Philadelphia, 1876. Cast-Steel Works of Fried. Krupp, Essen, Germany. French and Spanish. (4 copies.)

Profiles of Rails made. Plates showing Specifications of Work done. 2 volumes.

From W. Rotch, Fall River, Mass.:
Annual Report of Water Board of City of Fall River. January, 1877.

From F. Rziha, Vienna, Austria.
Construction of Rails and Railroad Superstructure. (German). Vienna.

From C. P. Sandberg, London:
Description of Standard Rail Sections. Appendix No. 1. London.

From Admiral B. F. Sands, Superintendent U. S. Naval Observatory, Washington, D. C.:

Astronomical and meteorological Observations made during 1874, at U. S. Naval Observatory.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: *regular* meetings, when ballots for members will be canvassed and other business done, Wednesday, June 6th and July 4th; and a *stated* meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held June 6th, July 4th and August 1st, at 3 o'clock P. M.

No regular or stated meetings of the Society will be held from July 4th to September 5th.

ADDITIONS TO LIBRARY AND MUSEUM. Acknowledgments of contributions to the Library, through the Centennial Commission of the Society are again unavoidably laid over.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Ramer Park.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The prescribed conditions are set forth in the Code of Rules herewith published; a copy will be furnished upon application.

No award having been made last year, it is announced that, under Rule VI, two premiums are offered for the coming year, one being a gold medal for the best paper, and the other, books (costing \$70 currency), for the second best paper, competing for the award.

INFORMATION IS WANTED OF JOHN CRUSE, C. E., a native of Ireland, graduate of Old Trinity College, who was on the Great Western Railway of England under Mr. Brunel; in 1856 he was engaged in surveying town sites along the Hannibal & St. Joseph Railroad, was previously upon location of this road, on what was then known as the Terre Haute & Richmond Railroad, and on the Ohio & Mississippi, Missouri Pacific and other railroads. Particulars may be sent the Secretary.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, June, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 24TH—30TH, 1877.—THE NINTH ANNUAL CONVENTION of the Society was held at New Orleans, April 24th and 25th, followed by a visit to the harbor protection boat, the ice manufactories, steam cotton presses and drainage works of the city, April 26th; an excursion to the jetties at the mouth of the Mississippi (stopping at Magnolia plantation), April 27th and 28th, and an inspection of the Bonét Carre crevasse, April 30th.^a

The following members and guests of the Boston Society of Civil Engineers, of the Civil Engineers' Club of the Northwest, of the Civil Engineers' Society of St. Louis and of this Society, were in attendance.

Alfred L. Rives of Mobile, Ala.; Charles A. Ferry and Albert B. Hill of New Haven and Mordecai T. Endicott of New London, Conn.; Edmund L. DuBarry and David E. McComb of Washington, D. C.; Frederick W. Clarke, A. Comstock, L. E. Cooley, George H. Frost, W. F. Goodhue, O. B. Greene, Max Hjortzberg, R. J. McClure, George C. Morgan, William H. Newton, L. S. Olmstead, E. Powell, Willard A. Smith and John H. Thomas of Chicago and William Sooy Smith of Maywood, Ill.; Lorenzo M. Johnson of Keokuk, Ia.; William R. Belknap, Albert Fink, Henry Fink, Frederick de Funiak, Frederick W. Merz and Frederick W. Vaughan of Louisville and John E. Earley of Somerset, Ky.; James A.

(a.) Full reports of the Convention have not yet come to hand; when received, the more important matter will appear under "Reports of Meetings."

Andrews, P. G. T. Beauregard, G. L. Blanchard, Charles H. Boyd, Elmer L. Corthell, Charles L. B. Davis, Caleb G. Forshey, Leon Fremaux, James Freret, Edward D. Frost, James H. Gardner, Thomas S. Hardee, Benjamin M. Harrod, G. Allon de Hemecourt, J. A. de Hemecourt, Charles W. Howell, W. J. Karner, Benjamin McLeran, E. P. Robinson, M. Rogers and Arthur J. Wrotnowski of New Orleans, La.; C. Frank Allen, Frederick Brooks, S. Clarence Ellis, Clemens Herschel, Arthur Hobart, Edward S. Philbrick, William Watson, Frank O. Whitney and Henry M. Wightman of Boston, Desmond Fitzgerald of Brookline, William Rotch of Fall River, Oliver E. Cushing, James B. Francis and A. S. Tyler of Lowell, Emory C. Davis of Northampton and David W. Cunningham of South Framingham, Mass.; H. P. Davock and Alfred Noble of Detroit, Mich.; Francis U. Farquhar, Joseph S. Sewell and Horace E. Stevens of St. Paul, Minn.; Niles Meriwether of McComb City and C. M. Perin of Ocean Springs, Miss.; William B. Cogswell of Mine La Motte, Philip N. Moore and Robert Moore of St. Louis, Mo.; Robert Fletcher of Hanover, N. H.; Charles B. Brush and Arthur Spielmann, of Hoboken, Charles D. Ward of Jersey City and William E. Kelly of New Brunswick, N. J.; John Bogart, Charles E. Emery, Charles R. Flint, Charles M. Harris, Sanford Horton, Thomas J. Long, Arthur Macy, George S. Morison, W. Milnor Roberts, William H. Wiley and William E. Worthen of New York, William H. Searles of Rochester, James P. Gould of Rondout and Horatio Seymour, Jr. of Utica, N. Y.; L. G. F. Bouscaren, Henry Earnshaw and Thomas D. Lovett of Cincinnati, Benjamin F. Morse and Charles H. Strong of Cleveland, O.; Edmund A. Doane and J. Foster Flagg of Meadville, Adolphus Bonzano and John Griffen of Phoenixville, Sidney T. Fuller, Franklin C. Prindle and Frank H. Taylor of Philadelphia, James Archbald of Scranton and Arthur Beardsley of Swarthmore, Pa.; Robert L. Engle and Samuel Whinery of Chattanooga, William H. H. Benyaud and Owen Meriwether of Memphis, and Wilbur F. Foster and Eugene C. Lewis of Nashville, Tenn.; James A. Hayward of Galveston and Milton G. Howe of Houston, Texas, and Charles McRitchie of Milwaukee, Wis.

The several sessions of the Convention, for the consideration of professional subjects and the transaction of regular business, were held at the Chamber of Commerce, April 24th and 25th, and the Convention dinner was had at Milneburgh, on Lake Pontchartrain, on the evening of April 26th.

THE FIRST SESSION was called to order Tuesday, April 24th, at 10 o'clock, A. M. by John Bogart, Treasurer of the Society. He introduced W. Milnor Roberts, Director and Past Vice-President, who made an opening address,^b and on motion, Caleb G. Forshey was declared Chairman of all but the business sessions of the Convention, John Bogart, Secretary, and Charles E. Emery, Associate Secretary.

(b.) See—Reports of Meetings, July Proceedings.

The following were presented :

From the Council of the City of New Orleans—March 27th, 1877:

"Whereas, information has reached this Council that a Convention of the most prominent civil engineers in the United States is to be held in this city on April 24th next, therefore be it—

"Resolved, that the hospitalities of the city be and are hereby extended to the members of said Convention, and that a committee be appointed, to consist of the Mayor, Administrator of Water Works and the City Surveyor to make suitable arrangements in carrying out the intention of this resolution."

From the Committee of the Council so appointed ; April 16th, 1877:

"Resolved, that the Committee * * * tender in behalf of the City Council, the use of its chamber to the American Society of Civil Engineers for holding its sessions, while in the City of New Orleans."

On motion, a committee of the Convention was appointed to thank the city authorities for these courtesies, and to tender them an invitation to attend the Convention and take part in its deliberations. The committee, in due course, reported that such had been done, and the invitation accepted by the Mayor.

A record of those in attendance was then taken.

An invitation from the Barataria Ship Canal Company, recently chartered by the Louisiana Legislature, for the purpose of securing a permanent ship canal from the Mississippi River to the Gulf of Mexico, to join in a proposed inspection of the route selected, on May 1st, was received and accepted in behalf of such members of the Convention as then would be able to attend.

The order of business, as previously announced in Proceedings^c and by circular, was taken up ; the topics as specified, to be named for discussion in regular order.

The consideration of professional subjects was entered upon, and the first topic—"Bridges," called ; under it discussions on "The Failure of the Ashtabula Bridge,"^d by Robert Briggs, Thomas C. Clarke, Theodore Cooper, Charles Hilton and C. Shaler Smith were read. An incomplete copy of the Report of Joint Committee of Ohio Legislature on the Ashtabula Bridge Disaster, was presented, and further discussion was had, by William H. Searles, William Rotch, Clemens Herschel, Edward S. Philbrick and others present.

The following resolutions, the first embodied in the paper of C. Shaler Smith, and the second offered by Clemens Herschel, were considered and referred to the regular meeting of the Society to be held during the Convention:

First.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law covering the points outlined on pages 125, 126, 127, 128, Transactions,^e May, 1875,

(c.) Page 22. (d.) Referring to—CXXXVII, The Failure of the Ashtabula Bridge. C. Macdonald. Transactions, Vol. VI, page 74. (e.) Vol. IV.

adding thereto the necessary provisions to secure the inspection by experts of all questionable bridges now in existence.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to the Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, towards procuring the passage of the specified law by the various State Legislatures during the coming winter.

Second.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law requiring tests of finished bridges before, and at stated times after, their opening for public travel.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to this Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, toward procuring the passage of the specified law by the various State Legislatures during their next session.

A paper by Charles E. Emery, on the "Relative Quantities of Material in Bridges of different Kinds and of various Heights," was read by the writer, and discussed by W. Sooy Smith, Edward S. Philbrick, John Griffin, Clemens Herschel, J. Foster Flagg and L. G. F. Bouscaren.

The second topic—"Hydraulics" was called: under it, a paper by Charles W. Howell, on the "Improvement of Entrance to Galveston Harbor," was read. The subject of harbor improvements was referred to, and discussion followed.

A paper by Theodore G. Ellis, on the "Flow of Water in open Channels" was read; remarks upon it were made by James B. Francis. Elmer L. Corthell made statement of the present condition of the works and what is proposed to be done, for the improvement of the mouths of the Mississippi; the paper by Caleb G. Forshey on "Cut-offs of the Mississippi River, their effect on the Channel, above and below," already published,^f was referred to, and a discussion by Prof. Forshey and others, followed.

A paper by William H. Searles, giving "Results of recent delicate Test Levels upon the Line of the Erie Canal," was read by the writer, and Elmer L. Corthell gave "Details of the Method of Determining the Slope of the Mississippi River, from New Orleans to the Gulf."

A paper by J. Foster Flagg, on the "Efficiency of Steam Vacuum Pumps,"^g was discussed by the writer, Charles E. Emery and William E. Worthen.

(f.) Referring to—CXXVI, Cut-offs in the Mississippi River, their Effect on the Channel above and below. C. G. Forshey. Transactions, Vol. V, page 317.

(g.) Referring to—CXXX, Efficiency of Steam Vacuum Pumps. Transactions, Vol. V, page 382.

The committee on "Gauging of Streams," J. James R. Croes, Chairman, was continued.

The Convention adjourned to meet at 7 o'clock, P. M.

THE SECOND SESSION was called to order at 7 o'clock, P. M.

A reply, by the late George W. R. Bayley, of New Orleans, to discussion of his paper on "Levees,"^h was read.

A report, as follows, of Committee on the Metric System of Weights and Measures was presented :

"The committee appointed to report to the Society a form of memorial to Congress, in furtherance of the adoption of the metric standards in the Office of Weights and Measures at Washington, as the sole authorized standards of weights and measures in the United States, respectfully submit the following draft :

"To the Honorable, the Senate and the House of Representatives of the United States, in Congress assembled :

"The memorial of the American Society of Civil Engineers respectfully sheweth :

"That the opinion is widely received that the metric system will eventually supersede the confusion of weights and measures, now in common use.

"That a desire for the proposed reform has been manifested among our people, especially among corporate bodies of physicians, druggists, teachers, architects, engineers and men of science, and that they may be expected to co-operate cordially, whenever Congress shall initiate a movement for the general adoption of the metric system.

"That the action of the United States government, whose relations with many of our industries are very extensive, must have a great, if not a decisive influence throughout the community.

"The prayer of your memorialist, therefore, is that your honorable body may enact, that in every publication, report, advertisement and other official document issued by any department of the United States government, *only* the metric system of weights and measures shall be used, on and after such date as your honorable body may deem the most advisable."

Clemens Herschel, Chairman of the Committee, offered the following to be submitted to letter ballot :

"Resolved, that the form of memorial submitted, be adopted by the Society, be signed by the President and Secretary and transmitted to the two Houses of Congress."

The following, offered by Theodore G. Ellis, of Hartford, Conn., was also submitted :

(h.) Referring to—CXXI. Levees as a System of reclaiming Low Lands. G. W. R. Bayley, Transactions, Vol. V, page 115.

Resolved, that a committee of five be appointed by the President, to consider and report upon what is the best system of weights and measures, for the use of engineers in the United States; that this committee have power to confer with committees from other societies for a like purpose, and that the foregoing be submitted to this Society, to be acted upon by letter ballot.

Upon separate motions, these resolutions were referred to the regular meeting of the Society, to be held during the Convention.

A paper by W. Milnor Roberts, on the "American Society of Civil Engineers, and its Future," and a memoir by Caleb G. Forshey, of the professional life and services of the late George W. R. Bayley, a Member of the Society, who died December 14th, 1876, were read.

The Convention adjourned to meet Wednesday, April 25th, at 10 o'clock A. M.

THE THIRD SESSION was called to order Wednesday, April 25th, at 10 o'clock A. M.

Elmer L. Corthell, for Resident Committee on Ninth Annual Convention, announced arrangements for excursions about the city on Thursday, and to the jetties on Friday.

J. A. de Hemecourt presented to the Society a memoir (in print), with charts, of a passage to the Gulf of Mexico, proposed by Gen. Buisson, in 1830.

The third topic, "Masonry," was called; and the Committee on "Nomenclature and Classification of Masonry," J. James R. Croes, Chairman, was continued.

The fourth topic "Railroads," was called; and the Committees on "Uniform Accounts and Returns of Railroad Companies," and on "Resistances of Railway Trains," William P. Shinn, Chairman, were continued.

The fifth topic, "Strength of Materials," was called, under it a report of Committee on "Tests of American Iron and Steel," was presented by W. Sooy Smith, Chairman, and discussed by him, Charles E. Emery, F. U. Farquhar and others.

It was moved, that a committee be appointed to prepare and present to the Convention, some form of definite action upon the subject of Tests of American Iron and Steel. John Griffen, Louis G. F. Bouscaren and Edward S. Philbrick, were appointed such committee, which subsequently made the following report, and it was adopted.

"Whereas, in 1872, a committee of members of the American Society of Civil Engineers was appointed to take into account and to ascertain the best way of establishing a Board for the testing of such metals and alloys as form parts of the structures and machines required for use by the citizens of this country; and—

"Whereas, under this appointment, the committee proceeded in its labors so far as to obtain favorable action from the Congress of the United

States, by a law authorizing the creation of a Board for the purpose of making such tests, and appropriating money to be expended therefor as well as in purchase of suitable machinery; and—

“Whereas, at a late session of Congress a law was passed,ⁱ whereby said Board would cease to exist upon the expenditure of the money then appropriated; be it—

“Resolved, that this Society deems the tests proposed to be made, to be of national importance, and therefore asks that so much of the Sundry Civil Appropriation Bill, passed by Congress, as provides that the Board to test Iron, Steel, and other Metals, shall be discontinued when the money appropriated for its use shall have been expended, be repealed; that the unexpended balance to the credit of the Board be re-appropriated, and that such further appropriation be made for the use of the Board as may be needed to complete the investigations undertaken—the sum required for the coming year being \$40 000.

“Resolved, that each member of this Society be urged to use such influence as he may possess, to obtain favorable and immediate action by the Congress of the United States in furtherance of the objects here prayed for.

“Resolved, That the above resolutions be printed, and several copies furnished to each member of this Society, to be used by him in promoting the object sought; and that reports of their action in the matter be made by each to the Secretary, giving names of representatives in Congress who have been addressed or seen on the subject.”

The papers *j* on “Qualities of Iron and Steel,” and on the “Rate of Set in Metals, subjected to Strain for considerable Periods of Time,” were discussed.

The Convention then adjourned to hold a regular meeting of the Society.

THE FOURTH SESSION of the Convention was held as a regular meeting of the Society, for the transaction of regular business.

On motion, W. Milnor Roberts was appointed President, *pro tempore*, and John Bogart, Secretary.

A report of the Centennial Commission of the Society, Theodore G. Ellis, Chairman, and one of the Committee on Quarters for the Society, John Bogart, Chairman, were presented and filed, and the Commission and Committee continued.

The amendment of the By-Laws, proposed by J. James R. Croes, and seconded by Edward P. North, at regular meeting of the Society, April 4th,^k was taken up, considered, and unanimously adopted.

The following amendments of the organic law of the Society were presented and considered:

(i.) Vol. II, page 100. (j.) Referring to—CXXVIII, Qualities of Iron and Steel. W. Metcalf. Transactions, Vol. V, page 323; and to CXXXIV, Rate of Set in Metals subjected to Strain for considerable Periods of Time. R. H. Thurston. Transactions, Vol. V, page 28. (k) See page 26.

10. Amendments to the Constitution, proposed by G. Leverich, and duly seconded.

ARTICLE XIX.—For “two” insert “five,” and for “thirty” insert “twenty-five.” The article will then read :

All candidates for admission to the Society must file statements, by themselves, setting forth the grounds of their claim to be elected ; be proposed by at least *five* members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least *twenty-five* days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon, previous to action by the Society.

ARTICLE XX.—For “thirty” insert “twenty-five,” and for last clause insert as below. The article will then read :

In elections for membership, of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after *twenty-five* days have elapsed from the time of mailing the notification. Negative ballots exceeding five per cent. of the total number canvassed shall exclude.

ARTICLE —. (A new article) :—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who from ill health, advanced age, or other good reason assigned, has a scanty income ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof, desirable additions to the Library and Museum.

ARTICLE —. (A new article) :—Upon the written request of ten or more Members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and, if resignation has not been tendered, or a satisfactory defence made, may then expel the accused. Such action shall be stated to him and the Society, and this shall be in any event the only public announcement of the matter.

ARTICLE XXII. (To read) :—Persons thus elected and duly qualified, who reside within fifty miles of the post-office in the City of New York, shall be deemed Resident ; and those who reside beyond this limit shall be deemed Non-Resident. The membership of any person shall begin on the day of his election.

ARTICLE XXIX. (To read) :—Members, who become Residents or Non-Residents by removal into or beyond the limits prescribed in Article XXII, shall be subject to assessments in the class in which they were

on the day of the Annual Meeting, as may appear upon records of the Society or by written notice to the Secretary.

2°. Amendment to the By-Laws, proposed by G. Leverich, and duly seconded.

SECTION 32. (To read):—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the Members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast, shall be necessary for the adoption of any such addition or amendment.

3°. Amendment to the Constitution, proposed by W. Sooy Smith, and duly seconded.

ARTICLE ...—Upon the written request of ten or more Members, that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall, in any event, be the only public announcement of the matter.

4°. Amendment to Article XX of the Constitution, proposed by Francis H. Farquhar, and duly seconded.

For "three," insert "five;" the Article will then read:

ARTICLE XX.—In elections for membership of either class, members shall vote by letter or by ballot, in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. *Five* or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

5°. Amendment to same Article, proposed by Charles H. Strong, and duly seconded.

For "three," insert "ten;" the Article, otherwise, will read as the preceding.

The following were considered and severally referred to the Board of Direction, to be submitted to the Society, and a letter ballot to be taken upon each.

1°. Moved by W. Sooy Smith, and duly seconded.

Resolved, that the reading of engineering subjects shall not form part of the proceedings of the Society at the regular meetings held during its

Annual Conventions ; and that special meetings, for the purpose of hearing and discussing such papers, may be held during the Conventions only when authorized by a two-thirds vote of members of the Society present at one of the sessions of the Convention.

20. Moved by Caleb G. Forshey, and duly seconded.

Resolved, that the Conventions of the Society be divided into three sections, and that the professional papers be read before the several sections, as they may be appropriate ; that the Convention shall adjourn from time to time, to give sections time for their meetings ; and that the members, writing papers be required to indicate to what sections they pertain.

The following, previously considered in Convention and referred to this regular meeting, were also severally referred to the Board of Direction, to be submitted to the Society, a letter ballot to be taken upon each : the resolutions offered in the first session, one by C. Shaler Smith, and one by Clemens Herschel, relating to inspection of bridges ; and the resolutions offered in the second session, one by Clemens Herschel, and one by Theodore G. Ellis, relating to a system of weights and measures.

The following, presented by Charles E. Emery, and duly seconded, was adopted :

Whereas, the metric system of weights and measures is now extensively used abroad ; and whereas, it is desirable that the relation of the merits of differing systems be made familiar to all, by comparison ;

Resolved, that members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

Resolved, that the Secretary of the Society be requested to maintain a standing notice of the above in the regular publications of the Society.

The time and place of the next Annual Convention were considered.

The Society then adjourned to again meet in Convention.

THE FIFTH SESSION of the Convention was then called to order.

Under amendment to By-laws, adopted at the regular meeting, the following were appointed a Nominating Committee : William E. Worthen, W. Sooy Smith, Frederick de Funiak, Joseph M. Wilson and Caleb G. Forshey.

James B. Francis was, for the time, called to the Chair, and a paper by Caleb G. Forshey on " Patents and Patent Laws, Inventions, Inventors and Authors " was read. Mr. Forshey resumed the Chair.

A paper by Thomas S. Hardee, on a " Novel Method of Railroad Survey," was read ; a discussion by William H. Searles and the writer followed.

L. G. F. Bouscaren gave a description, illustrated with drawings, of the recent tests of the new iron bridge over the Kentucky river, on line of the Cincinnati Southern Railway.

It was moved that the thanks of the Convention were due to the Chairman and Secretaries.

The following was adopted :

Whereas, the members of this Society—many traveling great distances—have received admirable and valuable facilities and courtesies in coming to and returning from this Annual Convention, held in New Orleans, and also during their stay in the city, from the officers of a number of railroad companies and from others, which are highly appreciated by the Society ; it is therefore—

Resolved, that the Secretary be requested to convey, at the earliest moment practicable, to each officer, or other person entitled thereto, the thanks of the Society for their courtesies.

The Convention finally adjourned.

MAY 16th, 1877.—A quorum not being present, no stated meeting was held.

JUNE 6th, 1877.—A regular meeting was held at 8 o'clock P. M.

The President made report for the Board of Direction of action taken to perfect the incorporation of the Society, which was approved and the action formally ratified.

Announcement was made, of appointment of Alfred W. Craven, Julius W. Adams, William E. Worthen, James B. Francis, and the President, as committee to prepare a memoir of the life and professional services of James P. Kirkwood, deceased.

The following was referred to the Centennial Commission, with instructions to report at the next regular meeting :

Whereas, it is proposed to have an exposition of the arts and industries of all nations in Paris during the coming year ; in view of the fact that foreign engineers and others engaged in constructions were greatly interested in the exhibition of the growth and present state of American engineering made at Philadelphia under the auspices of the Centennial Commission of this Society ; and that such interest may be renewed and increased by a similar exhibition in Paris, it is

Resolved, that the Centennial Commission of this Society be charged with the matter, with power to fill vacancies, to appoint sub-committees, and to arrange for the exhibition of plans, models, and specimens showing the progress in this country of engineering in its several branches, substantially as was done in Philadelphia ; the same to be without expenditure from any of the regular funds of the Society.

The first Wednesday in July being Independence Day, the next regular meeting was postponed to Thursday, July 12th.

OF THE BOARD OF DIRECTION.

MAY 21st, 1877.—An adjourned meeting was held at 4 o'clock P. M.

The Committee to perfect the incorporation of the Society made a report, which was accepted, and the action taken was formally ratified and completed.

There having been no award of the Norman Medal the past year, announcement was authorized,* that a premium, to consist of books, to cost \$70, currency, is offered for the second best paper competing for the Medal this year.

MAY 23D, 1877.—Adjourned meeting for consideration of applications for admission to the Society, was held at 3 o'clock P. M.

JUNE 6TH, 1877.—In absence of a quorum, the stated meeting was not held.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Algebra, Rules and Examples in —. Part I. T. Dalton. London. 18mo. *Macmillan*, (New York). \$1.25.
- Alkali Trade, the History, Products and Processes of —, including the most recent Improvements. Chas. Thos. Kingzett. London. 8vo, illus. (*Van Nostrand, New York*.) \$6.00.
- Animal Products: their Preparation, commercial Uses, and Value. (South Kensington Hand-book.) London. 12mo. *Chapman & Hall*, (Scribner, Welford & Armstrong, New York.) \$1.50.
- Antelope and Deer of America, a comprehensive scientific Treatise upon the natural History, including the Characteristics, Habits, Affinities, and Capacity for Domestication, of the Antilocapra and Cervidae of North America. John Dean Caton. New York. 8vo. *Hurd & Houghton*. (Announcement).
- Architect's Guide, being a Text-book of useful Information for Architects, Engineers, Surveyors, Contractors, Clerks of Works, &c. Frederick Rogers. London. 8vo. *Crosby & Lockwood*. 6s.
- Arctic Expedition, 1875-6. Journal of Proceedings, &c. (Parliamentary Report.) London. 8vo. 21s.
- Artillery. Handbook for Field Range Finder. Do. for 9-Pounder Rifle Muzzle Loading Guns. Do. for the 16-Pounder Rifled Muzzle Loading Gun of 12 cwt. (Parliamentary.) London. 8vo. Each 6d.
- Art. Renaissance in Italy: the fine Arts and Revival of Learning. John A. Symonds. 2 vols. London. 8vo. *Smith & Elder*. 32s.
- Astronomical and meteorological Observations, during 1874, at U. S. Naval Observatory. (Government publication.) Washington. 4to. *Goe. Printing Office*.
- Myths, based on Flammarron's "History of the Heavens." John F. Blake. London. 12mo, illus. (*Van Nostrand, New York*.) \$3.00.
- Astronomy, a popular —. Simon Newcomb. New York. illus. *Harpers*. (Announcement).
- The Origin of the World, according to Revelation and Science. J. W. Dawson. New York. 12mo. *Harpers*. (Announcement.) \$2.00.
- Birds of the Northwest, a Handbook of American Ornithology. Elliott Coues. Boston. 8vo, illus. *Estes & Lauriat*. \$4.50.
- Boiler Insurance and Steam Power Company Limited. Chief Engineer's Report, 1877. Manchester. 8vo, illus.
- Boilers. On the Combustion of refuse vegetable Substances, Straw, Cott'n Stalks and Brushwood, under Steam Boilers. John Head, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Eng.*
- Bridge. Report of Joint Committee of the Legislature of Ohio, concerning the Ash-tabula Bridge Disaster. Columbus. 8vo, illus.
- Bridges, Metropolis Toll —. (Parliamentary Report.) London. 8vo. 5d.
- Butter, its Analysis and Adulterations, specially treating on the Detection and Determination of foreign Fats. Otto Hehner and Arthur Angell. 2nd ed., re-written, imp. and enl. London. 12mo. *Churchill*. 3s. 6d.
- Bronzes of European Origin in the South Kensington Museum: a descriptive Catalogue, with introductory Notice. C. D. E. Fortnum. London. 8vo, illus. *Chapman & Hall*. 30s.
- Catalogue of English Books, containing a complete List of all Books published in Great Britain and Ireland in 1876, with Sizes, Prices, and Publishers' Names. London. 8vo. *Low*. 5s.
- Chemistry; why the Earth's Chemistry is as it is: Three Lectures delivered at Manchester. (Manchester Science Lectures.) J. N. Lockyer. London. 12mo. *Macmillan* (New York). \$0.25.
- Civil Engineer, to be or not to be—by One in Practice. London. 8vo. *Spon* (New York). \$0.20.
- Engineers. Memoirs of the Operations of the Society of —. November, Decem-

* Under Article VI, Code of Rules for the Award of the Norman Medal.

- ber, 1876. January, February, 1877. 2 vols. (French) Paris. 8vo, illus.
- Minutes of Proceedings of the Institution of —, with other selected and abstracted Papers. Ed. by James Forrest. Vols. XLVII, XLVIII. Session 1876-7. London. 8vo, illus. *Inst. Civil Eng.*
- Coffee Planting in southern India and Ceylon. E. C. P. Hull. London. 12mo. *Spons (New York)*. \$3.50.
- Confectionery. How to make Candy, a Manual of plain Directions for Manufacture of the more popular Forms of Confectionery. 2d. ed. Hartford. 12mo. *Fletcher*. \$0.50.
- Decoration, Designs for Furniture and interior House Decoration, after the latest modern Style. E. Plassman. In 8 parts. New York, folio, illus. *W. Lindemann*. Each part \$1.50.
- Modern Surface Ornament, a Collection of original Designs of detail Ornament, for the use of ornamental Designers generally. In 6 Parts. New York. 4to, illus. *Sabin & Sons*. Each part \$1.00.
- Docks, the Thames and its Docks: a Lecture. Alexander Forrow. London. 8vo. *Spottiswoode*. 2s. 6d.
- Earth (the), a descriptive History of the Phenomena of the Life of the Globe. E. Reclus. 3rd ed. London. 8vo. *Bickers*. 15s.
- Earthquakes and Volcanos; what is, and what is not, the Cause of Activity in —, R. A. Peacock. London. 8vo. *Spons (New York)*. \$0.20.
- Electro-Metallurgy, the Art of —, including all known Processes of Electro Deposition. G. Gore. New York. 12mo, illus. *Appletons*. \$2.50.
- Embroidery; Art Needlework: a Guide to Embroidery in Crewels, Silks, Appliqués, &c., with Instructions as to Stitches, and explanatory Diagrams; also a short History of the Art. E. Mase. London. 12mo. *Ward & Lock*. 1s.
- Engineers and Architects; Minutes of the Saxonian Society of —, Dresden. 8vo. (German).
- and Mechanics Pocket Book. Charles H. Haswell. New and rev. ed. New York. 12mo, illustrated. *Harper Bros*. \$3.00.
- Information for colonial —, ed. by J. T. Hurst. No. 3, India. F. C. Danvers. London. 8vo, illus. *Spons (New York)*. \$1.75.
- Engineering Papers, Abstracts of —, in foreign Transactions and Periodicals. Ed. by James Forrest. (Minutes of Proceedings, Institution of Civil Engineers, Vol. XLVII). London. 8vo. *Inst. Civil Eng.*
- Professional Papers on Indian —, Second Series. Ed. by A. M. Long. Roorkee. 8vo, illus.
- Floods in the Thames Valley, and the Relief of London Bridge and its Approaches. Francis J. Palmer. London. 8vo, illus. *Stanford*. 2s. 6d.
- Forestry, the Schools of — in Europe; a Plea for the Creation of a School of Forestry in Connection with the Arboretum at Edinburgh. John C. Brown. Edinburgh. 8vo. *Oliver & Boyd*. 2s.
- Foundation of the Washington Monument, Report of Committee. Washington. 8vo. *Gov. Printing Office*.
- Gardener, the new practical Window Gardener: being practical Directions for the Cultivation of flowering and foliage Plants in Windows and glazed Cases, and arrangement of Plants and Flowers for Embellishment of the Household. J. R. Mollison. London. 12mo, illus. *Groombridge*. 3s. 6d.
- Geological Explanations of the XL Parallel, Vol. VI. Microscopic Petrography. Fred. Zoikel. Washington. 4to, illus. *Gov. Printing Office*.
- Survey of Canada. Alfred R. C. Selwyn, Director. Report of Progress for 1875-6. Montreal. 8vo, illus. *Dawson*. \$0.25.
- of New Jersey, Annual Report of the State Geologist for 1876. Trenton. 8vo. *Geology, Elements of Agricultural*. William K. Kedzie. Cincinnati. 12mo. *Van Antwerp, Bragg & Co*. \$0.40.
- Guide to the Examination of —, J. M. Macbirtie. Glasgow. 12mo. *Hadden*. 2s. 6d.
- Measured Section of the Palaeozoic Formations in middle Pennsylvania. C. A. Ashburner. Philadelphia. 8vo.
- Geometry, Elements of —, G. M. Searle. New York. 8vo, illus. *Wiley & Sons*. \$2.00.
- Heat, Elements and Observations as to the Emission of — by hot Water Pipes. W. Anderson. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. of Civil Eng.*
- Handbook of Natural Philosophy. D. Lardner. New ed., re-written by Benjamin Lowry. London. 12mo, illus. *Crosby & Lockwood*. 6d.
- Hydraulic Tables, for finding the mean Velocity and Discharge in open Channels, specially adapted to most recent Formulae. Thomas Higham. London. 8vo. (*Van Nostrand, New York*). \$2.
- Iron and Steel Institute. Journal of —, Proceedings of the Leeds Meeting. London. 8vo, illus.
- Plates; experimental Enquiry into the Properties of Essex and Yorkshire wrought Iron Plates. D. Kirkaldy. London. 4to, illus.
- Labor, Talks about — and concerning the Evolution of Justice between Laborers and Capitalists J. N. Larned. New York. 12mo. *Appletons*. \$1.50.
- Landed Estates Management, Outlines of — treating of Varieties of Lands on the Estate, Peculiarities of Farms, Methods of Farming, Setting-out of Farms and Fields, the Construction of Roads, Fences, Gates and the various Farm Buildings, the Classes of waste or unproductive Lands, Irrigation, Drainage, Plantation, &c. R. S. Burn. London. 12mo, illus. *Crosby & Lockwood*. 3s. 6d.
- Light-House Board; annual Report of the —, for year ending June 30, 1876. Washington. 8vo. *Gov. Printing Office*.
- Lightning Protection, a practical Treatise on —, Henry W. Spang. Philadelphia. 12mo, illus. *Claxton, Rensen & Haffelfinger*. \$1.50.
- Locomotives; the Repairs and Renewals of —, A. McDonnell; with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers). London. 8vo, illus. *Inst. Civil Eng.*
- Machine Tools, a Treatise on — as made by William Sellers & Co. Philadelphia. 3d ed. 12mo, illus.
- Mammalia, an Introduction to the Osteology of —, W. H. Flower. 2d ed., rev. London. 12mo, illus. *Macmillan*. (*New York*). \$2.25.
- Maritime international Law. John A. Dahlgren. Ed. by Charles Cowley. Boston. 8vo. *Russell*. \$1.50.

- Ports of France. Government Publication. (French.) Paris. 8vo, illus.
- Mechanical Engineers, Proceedings of Institution of —. January, 1877. Birmingham. 8vo, illus.
- Mines and Mining at the International Exhibition at Philadelphia. F. Althaus. (German.) Berlin. 8vo.
- Mississippi River. Sixth Report on the Improvement of the South Pass of —. C. B. Comstock. 8vo, illus. *Gov. Printing Office.*
- Mouldings, Manual of Gothic —. F. A. Paley; with add. and impr. by W. M. Fawcett. 4th ed. London. 8vo. *Van Voorst.* 7s. 6d.
- Musical Theory, Manual of —. Carl F. Weitzman. Ed. by E. M. Bowman. New York. 8vo. *Pond.* \$2.50.
- Navy. Engineer Officers. (Parliamentary) Report and Evidence. London. 8vo. 3s. 8d.
- Water-tight Compartments. (Parliamentary) Return. London. 8vo. 7d.
- Ordnance. Annual Report of the Chief of Bureau of — U. S. Navy, for year ending June 30, 1876. W. N. Jeffers. Washington. 8vo, illus. *Gov. Printing Office.*
- Annual Report of the Chief of — of U. S. Army for year ending June 30, 1876. S. V. Benet. Washington. 8vo, illus. *Gov. Printing Office.*
- Physics. Elementary Text-Book of —. J. D. Everett. London. 12mo. (*Van Nostrand, New York.*) \$1.75.
- Physiology. Text-Book of —. M. Foster. London. 12mo, illus. (*Van Nostrand, New York.*) \$6.00.
- Pottery and Porcelain; a Manual of Marks and Dictionary of easy References. W. H. Hooper and W. C. Phillips. New ed. London. 16mo, illus. (*Van Nostrand, New York.*) \$1.75.
- Projectiles. Hand-book on the Theory of the Motion of —; the History, Properties, Manufacture and Proof of Gunpowder and the History of Small Arms, for Use of Officers sent to the School of Musketry, (British Government Publication.) London. 8vo. 1s. 6d.
- Railroad Employees in France, an Account of the Organization of Railroad Service of a French Railroad, with the Position, Privileges and Pay of Men of different Grades, and the full Regulations of Provident and Pension Funds. F. Jacquemin. Trans. from French. New York. 12mo. *Railroad Gazette.* \$0.25.
- Railway Accident at Radstock. (Parliamentary Report.) London. 8vo. 2s. 6d.
- Accidents. Returns October—December, 1876. Report of Royal Commission, with Evidence. 2 parts. (Parliamentary.) London. 8vo. 15s. 4d. and 13s. 10d.
- Commissioners' 3d Report. (Parliamentary.) London. 8vo. 6d.
- Inspectors' Report. Parts 6, 7, 8. (Parliamentary.) London. 8vo. 8s. 3d.
- Signal Arrangements and System of Working. (Parliamentary Report.) London. 8vo. 9d.
- Railways. Bills, &c. Board of Trade. (Parliamentary.) London. 12mo. 6d.
- Economic Theory of the Location of —. Arthur M. Wellington. New York. 8vo, illus. *Railroad Gazette.* \$2.00.
- Rapid Transit. Board of the Department of Public Works. Report of the Civil and Topographical Engineers, and the Landscape Architect, accompanying Plans for local Steam Transit Routes in 23d and 24th Wards. New York. 8vo. Map.
- In New York. Report of Allen Campbell, Commissioner of Public Works. New York. 8vo.
- Royal United Service Institution, Journal of —. Nos. 89, 90. London. 8vo, illus. (2 Numbers.)
- Sanitary Engineering. Series of Lectures before the School of Engineering, Chatham. Air; Water; the Dwelling; the Town and Village; the Disposal of Sewage. J. Bailey Denton. London. 8vo, illus. *Spons (New York).* \$10.00.
- Science Examiner: Sound, Light and Heat. James Monckman. Leeds. 12mo. *Bean.* 4d.
- Lectures delivered in Manchester, 1875—6. 7th and 8th series. Manchester, 12mo. *Hegwood.* 2s. 6d.
- Sewage Question (the). C. M. Baizegette. (Minutes and Proceedings Institution of Civil Engineers.) London. 8vo. *Inst. Civil Eng.*
- Sewerage, its Advantages and Disadvantages, Construction and Maintenance. E. S. Chebrough. Boston. 8vo.
- Shipbuilder, the Progressive —. John W. Griffiths. 2 vols. New York, 4to, illus. *Bicknell.* \$12.00.
- Smithsonian Report for 1874. Washington. 8vo. *Gov. Printing Office.*
- Steam Engine (the). F. T. Bramwell. (Science Lectures at South Kensington.) London. 12mo. *Macmillan (New York).* 6d.
- the relative Merits of simple and compound Engines, as applied to Ships of War, with Appendix containing Particulars and Analyses of recent Experiments, N. McDougall, Portsmouth, 8vo, illus. *Griffen* 4s. 6d.
- Steel. On the Relationship of Structure, Density and chemical Composition of —. J. W. Langley. New York. 16mo.
- Strains, the Theory of transverse — and its Application in the Construction of Buildings. Robert G. Hatfield. New York, 8vo, illus. *Wiley & Son.* \$5.00.
- Tables for Engineers, Boiler Makers, Ship Builders, Ship Owners, &c. F. W. Wymer. 2d ed., en. Glasgow, 8vo. *Forrester.*
- Telephone, its Uses. A. E. Delbecq. Boston. *Lee & Shepard.* (Announcement.)
- Trade Marks and Trade Names, a Treatise on the Law of —, with a Supplement containing the Trade Marks Registration Acts, 1875 and 1876. H. Ludlow and H. Jenkins. Also Rules, Introductions and Notes by James Bryce. *Maxwell.* 10s. 6d.
- Work and Pay; or, Principles of industrial Economy. Two Courses of Lectures delivered to Working Men in Kings College, London. L. Levi. With Report of the Committee of the British Association on Combinations of Laborers and Capitalists. London. 12mo. *Strahan.* 1s.
- Zoological Classification; a Handy Book of Reference: with Tables of Sub-Kingdoms, Classes, Orders, &c., of the Animal Kingdom, their Characters, and Lists of the Families and principal Genera. F. P. Pascoe. London. 12mo. *Van Voorst.* 6s. 6d.
- Zoology; a Description of Types of Animal Structure, Andrew Wilson. London, 12mo. (Science Manual.) *Chambers.* 1s.

ADDITIONS TO LIBRARY AND MUSEUM.

NOTE.—Members and others are asked to contribute regularly to the library of the Society, copies of government, municipal, railway, canal and other reports, specifications, profiles, maps, photographs and like matter, making up the record of engineering operations for the past or present, and to inform the Secretary where such may be had. Duplicate copies are desired, for transmission to foreign societies in return for works collected and sent to this library by them; also for exchange with members and others who wish complete sets referring to particular subjects. In order to gather material now considered of but little value, but of great future importance in the history of the public works of this country and a comparison of their economical results, donations are solicited of old reports or pamphlets, which in any way refer to their construction or operation.

"Copies for distribution" named in this list will, in order of receipt, be sent to members who apply, until the supply is exhausted.

BY THE CENTENNIAL COMMISSION OF THE SOCIETY.

AUSTRIA.*

The following were donated through the Austrian Society of Engineers and Architects:

From A. Bornches:
Harbor Improvements at Trieste. Atlas and 2 sheets.

Report on the Vienna Exposition, 1873. (German and Italian.) 2 volumes.
Workshops at the Paris Exposition (German), 1867.

From H. B. Buschmann:
Theory of Truss and Suspension Bridges (German).

From Commissioners of the River Danube:
Description of Works at Vienna for Improvement of the Danube, with map. (German.)
Report referring to same. (German.)

From A. Denartain:
The Fairlie System of Locomotives. (German)

From S. Fasbender:
Proceedings at the Brewers' Convention, (German).
Treatise on practical Architecture. (German).
— on Boilers, Locomotives and Rolling Stock. (German.) 3 volumes.
— on Descriptive Geometry.

From A. Friedman:
Official Report on Naval Affairs at Universal Exposition at Vienna. (German and French). 2 volumes.

Plans for St. Marc Central Cattle Market, Vienna. 5 drawings and a photograph.

From M. Gesell and E. Hornig:
Photographic Annals, 1871-6 (German). 6 volumes.

— Correspondence (German). 5 volumes.

From E. von Gottsleben:
Book of Railway Plans. (German).

From M. Gumbinna:
Treatise on the Distillation of Spirits.

From Hattich and Wilhelm:
Railway Station at Trieste. Plan and Details: 10 sheets.

* A free translation is given of this and other foreign lists. The original catalogue by the Resident Secretary, of Donations to the Library and Museum, through the Centennial Commission of the Society, is deposited in the Library, for reference.

Railways on steep Grades. (German.) 2 volumes.

From the Imperial Royal Commission of Austria:
Catalogue of the Austrian Exhibit. (English-German.)

From G. Klein, A. Schinall and A. Gartner:
Structures with pneumatic Foundations; an album of photographs.

From P. Klubek:
Direct acting Steam Engine. Description in German and English, with drawings.

From K. Kockert:
Tables for Calculation of Railway Curves.

From S. Kohn:
Annual Journal of Railways in the Austro-Hungarian Empire. (German.)

From G. Kosack:
Society for Inspection and Insurance of Steam Boilers. (German).

From A. Köstlin:
Building Gazette, 1874-75 (German). 2 volumes.

From A. Lazar:
Iron Bridge. 4 lithographs, framed.

From G. Leuschner:
Consideration of Expenses at Railway Depots. (German.)

From A. Mayer:
Railway and Postal Map of Austria and Hungary.

From M. Morawitz:
Bridge of the Eastern N. W. R. R. over the Danube. (German.)
Railway Curves. (German.)
— Economy. (German.)
Railways in Time of War. (German.)

From W. von Nördling:
Development of the French System of Railways. (German.)
Narrow Gauge Railways. (German.)
Railway Competition and Consolidation in England. (German.)

From Obach & Lubrecht:
Railway Ferry across Dover Channel. (German.) Text and plates.

From M. Olmeyer:
Submarine Surveying. (German.)

From M. Paridiser:
Methods of Harbor Construction (German).
3 volumes.

From R. Paulus:
Railroad Excavations and Embankments.
(German.)

From E. Pontzen:
Methods Employed in America to clear Rail-
roads from Snow. (German.)
Propositions for facilitating Construction of
Railroads. (German.)
Safety Couplings (German.)
The new Commercial Port at Trieste. (Ger-
man.)

From A. Riedler:
Report of School Committee on Inspection of
Machinery Construction. (German.)

From F. Rziha:
Construction of Tunnels. (German.)

From E. Sax:
Railway Economy. (German.)

From H. Schmidt:
Bridge Building, Contribution to —. (Ger-
man.)
—— over the Danube at Stadtilau, (Ger-
man.)

Description of Main Building, Universal Ex-
position at Vienna. (German.)

From S. Schoen:
Construction of Tunnels. Text and atlas.
(German.)

From E. Schrabetz:
Description of Apparatus for bending Rails.
(German.)
Design for Car Coupling; a drawing.

From M. Schüller:
Statistics of the Austro-Hungarian Railroads,
1866-69. (German.)

From A. de Servas:
Construction of Railroads; an atlas.
Station on Austrian National Railway at Pesth.
4 drawings, framed.

From M. Soundorfer:
Austrian Engineers and Architects' Calendar.
(German.)

From E. Steiner:
Compendium of Laws relating to Railways.
(German.)

From E. Stohr:
Treatise on Mining. (German.)

From E. Tülp:
Handbook of Railroads and Railroad Supplies.
(German.)

From L. Topowitz:
A Movable Railroad Station. 2 drawings.

From F. Waisell:
Handbook for Machinists. (German.)

From B. von Waldheim:
Railroad Guide for Travellers in Austria and
Hungary. (German.)

From S. Weiner:
Machinery Drawings, an album.

From C. Werner:
Studies of Tachometry. (German.)

From M. von Weiskamp-Siebenberg:
Handbook of Damages by Fire. (German.)

From G. von Wax:
Decrease of Water in Wells, Rivers and
Streams. (German.)

From M. Willfort:
Fireman's Gazette, 1874-5. (German.) 2 vol-
umes.

From E. Winkler:
Lectures on Bridge Construction. (German.)
3 volumes.

—— on Railway Construction. (German.)
3 volumes

Pocket-Book for Civil Engineers. (German.)
—— for Mechanical Engineers. (Ger-
man.)

Questions in the Study of Heat. (German.)
Study of the Elasticity and Strength of
Metals. (German.)

Technical Guide to Vienna. (German, French.)
2 volumes.

Theory of Back-Pressure in Steam Engines.
(German.)

From H. Wunderlich:
Comparative Value of Anthracite and Bitu-
minous Coal for Heating Purposes. (Ger-
man.)

From C. von Yunker:
Tables of Heights and Barometric Pressures.

BELGIUM.

From J. Deby:
Plans of Eugene Rollin's Forges and Foun-
dries. Drawings.

Proceedings of the Anonymous Society.
(French.) 2 volumes, with drawings.

From the Royal Commission of Bel-
gium:
Catalogues of the International Exhibit of
Belgium.

From E. Scharr:
Railroads in Belgium, (French,) with Pho-
tographs.

BRAZIL.

From the Imperial Commission of
Brazil:
Catalogue of the International Exhibit of
Brazil.

Empire of Brazil.
Maps of Brazil.

Railroads of the Province of St. Paul.

BRITISH COLONIES.

Notes in the Colony of Victoria. Official Rec-
ord. 1873.

Mineral Map, general Statistics, Progress
and Resources of New South Wales.

Report on Dominion Lands of Canada.
—— on Queensland Tin Field.

FRANCE.

From the School of Roads and Bridges,
Paris:

Catalogue of Exhibits at International Exhi-
bition. (English-French.)

Public Works in France. Text, (French) and
portfolio of drawings.

From F. Reynard, Paris:
Industrial Annals. (French.)

The Technologist. (French.) 2 volumes, 17
numbers, also an Index.

Treatise on Metals. (French.)

GERMANY.

From the German Imperial Commis-
sion:

Arrangements for the Elevation of Workmen.
(German.) 2 copies.

Catalogue of the German International Ex-
hibit. (English-German.)

Siezerland's Exhibit. 5 Photographs.

Statistics of Prussian Railways. (German.)

Tables and Rules for Railway Construction.
(German.)

From F. Krupp, Essen, Prussia :
Krupp's Works and Manufactures. 2 portfolios of illustrations.

GREAT BRITAIN.

From F. Beloe :
Drilling Machines used at St. Gothard Tunnel. 5 lithographs and 5 photographs.

From John Brierly & Sons :
Description of Patent Railroad Signals. 2 copies.

From the British Royal Commission :
Catalogue of Exhibits in the British Section at the International Exposition in Philadelphia.

From James Dredge :
Report on the International Exposition at Vienna. 4 volumes.

From Saxby & Farmer :
System of Railroad Signals, a set of lithograph drawings.

ITALY.

From the Italian Royal Commission :
First Congress of Engineers and Architects. (Italian.)

NETHERLANDS.

From the Royal Commission of the Netherlands States :
Catalogues of International Exhibit in Section of the Netherlands States.
Collective Exhibit of Public Works. 10 photographs.
Harbor at Flushing, an engraving.
Method of reproducing Maps and Drawings.
Sugar Manufacture and Tax. (German.)

PORTUGAL.

From the Royal Commission of Portugal :
Catalogue of the Portuguese Exhibit.

RUSSIA.

From V. D. Howen :
Map and Profile of Railroad from St. Petersburg to Moscow.

From Russian Imperial Commission :
Catalogue of the Exhibit of Russia.

SPAIN.

From the Royal Commission of Spain :—
Catalogue of the Spanish Exhibit.
Etching, an Essay before the Artists' Society. (Spanish.)
Experiments with Apparatus for measuring Base Lines. (Spanish.)
Maps of Galicia and of Spain. 2 sheets.
Spanish School of Civil Engineering. Pamphlets relating to—as follows: (Spanish.)
Catalogue of Library.
Conditions of Admission.
Course of Mathematics.
History of the School.
Rules and Regulations.
Schedule of Studies.
Study of Inundations. (Spanish.)
Treatise on Marine Structures. (Spanish.)
War and Geology. (Spanish.)

SWEDEN.

From the Swedish Royal Commission :
Catalogue of the Swedish Exhibit.
Kukaldy's Experiments on Fagersta Steel.
Military Bridge Equipage.
State of Iron Manufacture in Sweden.

SWITZERLAND.

Through the Swiss Commission.

From the North-East Railroad of Switzerland, Engineer's Department :
Bridge over the Aare at Burgg. a lithograph.
Bridges on Line of the North-East R. R. Descriptions (French) and portfolio of drawings, also 7 photographs.

Construction of the North-East R. R. Description (French) one portfolio of 82, and another of 97 sheets.

Plan and Profile of the North-East R. R., portfolio of lithographs.

State Railroads of Belgium, P. Scharr, text (French), and 3 photographs.

From the North-East Railroad of Switzerland, Machinery Department ;
Locomotives, Tenders and Cars. 2 portfolios of drawings, lithographs and photographs.
Machinery. Descriptions and Drawings. J. Deby. Text and Atlas. (French.)

From United Railways of Switzerland :
Plans and Descriptions of a Railway over the Luckmanier, and over the Splügen. (French.) 3 volumes.

From W. Weissenhart, Zurich :
Hydraulic Motors in Switzerland, a portfolio of drawings.

From other Exhibitors :
Atlas of Charts showing the Development of Industry and Commerce.

Bridge at Brugg: photographs of drawings.

— of the Canton of Berne: drawing.
Catalogue of the Exhibit of Switzerland.
Designs for a Hospital for Women, drawings.
Houses for Workmen, portfolio of photographic plans.

Hydraulics. (French.)

Maps of Swiss Railways. 2 sheets.

Project for a Railroad by the Luckmanier, portfolio.

Report as to Excess of Estimate for the Tesin Railways. (French.)

— on Administration of Construction for Canton, Berne. (French.)

St. Gothard Tunnel. Description and Reports. 10 volumes and a drawing.

Water Distribution, by a new Method (French).

UNITED STATES AND CANADA.

From Theodore Allen, St. Louis, Mo. :
Iron Tow Boat for Mississippi River, Stern wheel. United States Transport, O. G. Wagner for western River Navigation. Stern wheel. 2 photographs.

From American Bridge Co., Chicago :
Album of Centennial Exhibit. (Several copies.)

From James Archbald, Scranton, Pa. :
Dam of Gas and Water Co. at Scranton—drawing.

Plan and Elevation of the Archbald Coal Breaker, D. L. & W. R. R., Scranton.

From Arkansas State Commission, Little Rock, Ark. :

Financial Resources of Arkansas.
Resources of the State of Arkansas.

From H. P. Birkenbine, Philadelphia :
Condensing pumping Engine, Engine House and Stand-Pipe, Harrisburgh Water Works, Plans and Details. 14 drawings.

Pumping Engines for Water Supply. (Copies for distribution.)

The Schuylkill River, Gauging its Flow—the Dam. Value of Fairmount Water Power. (2 copies.)

- From C. H. M. Blake, Worcester, Mass.:
Dam of the Lynde Brook Reservoir, after its
Destruction by a Flood, March 30th, 1876.
5 photographs.
- From Lorin Blodgett, Philadelphia:
Industries of Philadelphia.
- From E. W. Bowditch, Boston, Mass.;
Three Topographical Maps, as follows:
Brookline and Walnut Hill Cemeteries.
Proposed rural Parks for Boston.
Quinobequain, a Tract of 100 acres.
- From Cambria Iron Co., Johnstown:
Album of Shapes. (Several copies.)
- From Centennial Commission of the
Society, New York:
Advertisements of Interest to Engineers, col-
lected during the Exhibition. Portfolio.
Catalogues, Official—, International Exhibi-
tion. Parts, I, II, III, IV. 1st and 2d
ed. (Several copies.)
— of the Argentine, German, Japanese,
and Peruvian Sections. (1 copy each.)
— of scientific, naval and military Works.
Van Nostrand.
Decimal System of Weights and Measures.
System of Constructions. M. Heath.
The new Tachometer. (German.)
— Water Locomotive. (French.) A. Huet.
- From O. Chanute, New York:
Kansas City Railroad and Carriage Bridge. 4
photographs.
Map of Erie Railway and Profiles of its
Branches.
Profile of Erie Railway.
- From Stephen Chester, New York:
Fire Alarm Telegraph. (Several copies.)
- From Clark, Reeves & Co., Philadelphia:
Album of Centennial Exhibit. (Several
copies.)
- From G. H. Cook, New Brunswick, N. J.:
Topographical and Geological Map of the Clay
District of Middlesex County, N. J.
- From J. D. Cook, Toledo, O.:
Annual Reports of Toledo Water Works for
1875 and 1876. (Several copies each.)
Stand Pipe at Sandusky, a drawing.
View of Water Works at Toledo, a photo-
graph.
- From Cooper, Hewitt & Co., New York:
Description of Exhibit at International Ex-
hibition. (Copies for distribution.)
- From J. J. R. Croes, New York:
Manuscript Statistics of 93 Water Works in
the United States, contributed in Reply to
Circular of Committee of the Commission.
(Bound in 5 volumes.)
Reports of 57 Water Works of the United
States, similarly contributed, (Bound in
25 volumes.)
- From C. Davis, Alleghany City, Pa.:
Plans of Sewage Basins, Man-Holes, Side and
Corner Basins, as used in Alleghany City.
- From Joseph P. Davis, Boston, Mass.:
Drawings and Photographs of New Water
Works, Boston, as follows:
Bridge, Charles River. 2 drawings and a
photograph.
— Wabun Valley; a drawing.
Conduit, Sudbury River. Map, profile
and sections. 4 drawings.
Culvert, Hurd's Brook; a drawing.
Gate House, Chestnut Hill Reservoir; a
drawing.
—, — compound—; a drawing.
Siphon Chamber, a drawing.
Waste Weir; a drawing.
- Reports on Additional Supply for Boston.
Complete set.
- From Theodore W. Davis, Poughkeeps-
ie, N. Y.:
Poughkeepsie Sewerage, main Sewer, Fallkill
District. 1 sheet.
- From Detroit Bridge & Iron Works,
Detroit, Mich.:
Iron Bridges. 5 photographs in a frame.
- From P. H. Dudley, Cleveland, O.:
Profile showing Resistances to be overcome
in moving Railway Trains.
- From H. Earnshaw, Cincinnati, O.:
Photographs of Pumping Engines and Eden
Park Reservoir, Cincinnati Water Works;
as follows:
Engine Room and Pump House. 3 sheets.
Pumping Engines. 3 sheets.
Reservoirs and Eden Park. Plans and
details. 9 sheets.
Water Pipe of Wood, laid in Cincinnati; about
49 years in use.
- From Edgar Thomson Steel Works,
Bessemer, Pa.:
Two Photographs of the Works.
- From Empire Transportation Co., Phil-
adelphia, Pa.:
American fast Freight System. (2 copies.)
Brief History of Petroleum. (6 copies.)
- From Engineer Department, U. S. A.:
Washington, D. C.:
Annual Report of Chief Engineer, 1875. 3
vols.
Art of War in Europe. Delafield.
Beton Agglomerate. Gillmore.
Canal to connect Chesapeake & Ohio Canal
with Baltimore.
Casemate Embrasures. Totten.
Colorado River of the West. Ives.
Commission to Europe. Mordecai.
Compressive Power of Timber.
Defences of Charleston, with Supplement.
Gillmore.
— of Washington. Barnard.
- European Light House Systems. Elliot.
Experimental Firing of modern Sea Coast Ar-
tillery. King.
Explorations of the 40th Parallel. 3 vols.
King.
Fabrication of Iron for defensive Purposes,
with Supplement. Barnard, Wright and
Mihler.
Foundations on compressible Soils. Dela-
field.
Geological Explorations, west of 100th Meri-
dian, as follows:
Astronomical Report. 1872-3.
Catalogue of Plants. 1871-3.
Explorations in Nevada and Arizona in 1871,
with Maps.
Invertebrate Fossils. Vertebræ collected
in 1874.
Ornithological Specimens. 1871-3.
Progress Report; 1872; with Maps.
Set each, of Photographic and Stereoscopic
Views.
Hydraulic Gates and Dams on the Ohio River.
Weitzel and Merrill.
Improvement of Holston and Tennessee
Rivers. Long.
— of Mouths of the Mississippi River, a
Memorandum. Humphreys.
Instructions for Meteorological Observations.
Iron Lock Gates.
— Pile Shafts.
Irrigation of California.
Limes, Hydraulic Cements and Mortars.
Gillmore.

Mean Declination of 981 Stars. Comstock.

National Defenses.

Nebraska and Dakota. 1855-6-7. Warren.

North Sea Canal. Barnard.

Physical Features of Minnesota Valley. Warren.

Physics and Hydraulics of the Mississippi

River. Humphreys and Abbot.

Potomac Aqueduct. Turnbull.

Pressure of the Blast.

Reconnaissance in North Western Wyoming. Jones.

— in South and South Eastern Nevada.

— of Black Hills; with Maps. Ludlow.

— of Missouri River. Roberts.

— of the Ute Country. Ruffner.

— of the Yukow River. Raymond.

Removal of Blossom Rock. Williamson and Heuer.

Report on Building Stones. Gillmore.

Siege of Fort Pulaski. Gillmore.

Stability of the Arch. Woodbury.

Submarine Tunneling. Foster.

Sustaining Walls. Woodbury.

Tables and Formula. Lee.

Use of the Barometer, with Appendix. Williamson.

Yellowstone Expedition of 1870; with Maps. Doane.

— Explorations. Reynolds and Hayden.

From J. T. Fanning, Manchester, N. H.:

Embankments of Impounding Reservoir,

Norwich (Conn.), Water Works; a drawing.

From G. Ferris, Jersey City, N. J.:

American Water and Gas Pipe Co.

From A. Forsberg, Lynchburg, Va.

Sectional Elevation of Pumping Engine,

Lynchburg Water Works; a drawing.

Water Pipe, 4 inch cast iron—; laid in Lynch-

burg; 48 years in use.

From James B. Francis, Lowell, Mass.:

Lowell hydraulic Experiments.

From Franklin Institute, Philadelphia:

Report upon the metric System of Weights

and Measures.

From G. Brown Goode, Washington:

Classification of the Exhibition Collection,

illustrating the Animal Resources of the

United States.

From Frederick Graff, Philadelphia:

History of the Steam Engine in America.

(Copies for distribution.)

Engine House in Centre Square, Philadelphia,

1802; a drawing.

Note upon the Water Works of Philadelphia,

1804-15. (Copies for distribution.)

Water Pipe, 20 inch cast iron—; laid in Phila-

delphia, in 1820; 53 years in use and the

first of its size made in this country.

Wooden Boiler and cast iron Boiler, used in

Philadelphia, 1802; a drawing.

From George B. Grant, Boston, Mass.:

Calculating Machine or difference Engine, a

photograph.

From James H. Harden, Philadelphia:

Model of an adjustable Drawing-Table.

From Hathorne, Davis & Co.:

Model of 200 Horse Power compound differ-

ential Expansion Pumping Engine.

From Hawkins & Burrell, Springfield,

Mass.:

Drawings, as follows:

Highway Bridge at Lee, Mass.

Iron Bridge, Cheshire R. R.

— Deck Bridge, Boston & Providence

R. R. (On same sheet a Howe Truss, and

3 trussed Engine House Roofs.)

— Howe Truss Bridge, Boston & Prov-

idence R. R., built in 1849.

Wooden Bridge, Cheshire R. R.

Original Model of a Truss Bridge, in Iron,

as proposed by William H. Howe.*

From D. F. Henry, Detroit, Mich.

High Pressure, direct acting, Pumping En-

gine, Detroit Water Works. A drawing.

Rubber Valve for Pumps.

From W. Hildebrand, Brooklyn, N. Y.:

East River Suspension Bridge; photograph of

perspective drawing.

From A. L. Holley, New York;

The Vulcan Iron Company's Bessemer Steel

Works. 5 drawings, framed.

From A. F. Holloway, Cleveland, O.:

Duplicate compound Pumping Engines.

Cleveland Water Works; a drawing,

framed.†

From Thomas Holt, Portland, Me.:

Bridges on Maine Central R. R. Album of 5

photographs.

Covered Bridge across Kennebec River at

Augusta, Me., a detail drawing.

From Illinois State Commission, Chi-

cago, Ill.:

Report of Board of Public Works, Chicago,

for 1875. (2 copies.)

— of Board of Trade, Chicago, for 1876.

— on Packing in the West, (Copies for

distribution.)

From Indiana State Commission, In-

dianapolis, Ind.:

Agricultural Report of Indiana.

Geological Survey of Indiana.

20th, 22d and 23d Reports of the Indiana

Superintendent of Public Instruction. 3

vols.

From Iron and Steel Association, Phil-

adelphia, Pa.:

Iron Works of the United States.

From John B. Jervis, Rome, N. Y.:

Carbondale Railroad. Portfolio of original

Drawings of Machinery and Structures, as

follows:—

Axle Box, 3 sheets.

Bridges, 2 sheets.

Car Brake.

— Wheel and Axle, 5 sheets.

Castings, Details, 7 sheets.

Coal Car, 2 sheets.

Driving Wheels, Eccentrics, &c., 4 sheets.

Dwelling House.

Engines and Boiler at Head of Planes.

Freight Cars, 5 sheets.

Frog.

Locomotive Engine.

Machinery of Planes, Nos. 5, 6, 7, 8; 10

sheets.

Passenger Coach, Elevation and Details,

3 sheets.

Spikes and Bed Plate for Rails.

Switch.

Turn Table.

Chenango Canal. Contracts for same; 3 forms.

Portfolio of original Drawings of Structures,

as follows:

Aqueducts, a wooden—the Chenango, the

Oriskany, the Scholharie Creek, and the

Upper Mohawk, 5 sheets.

Bridges, Farm and Road, 3 sheets.

Culverts and Gates, 2 sheets.

Dam and Guard Gate.

* Subject to order of heirs of the Howe

estate.

† Subject to his order.

- Lock Gates, Plan and Details, 3 sheets.
Locks, Plan and Details, 6 sheets.
Reservoirs, the Bradley and Eaton Brook, 2 sheets.
Waste Weir.
Croton Aqueduct. Contracts and Specifications (Office Set for John B. Jervin, Chief Engineer).
— Portfolio of original Drawings of Structures, as follows:
— Aqueducts on Side Hills.
— across Ravines and low Ground;
Plan for Support.
Arches, Iron Lining for—
Bridge, Harlem River; Plans and Details, 3 sheets.
—, Sing Sing; Plan and Details, 2 sheets.
Bridges over Clendenning Valley; Plan and Details 2 sheets.
Culvert, general Plan.
—, Hale's Brook.
—, Sawmill River, 2 sheets.
Dam, Croton River; Plans and Details, 2 sheets.
—, Coffey, at Harlem River Bridge.
Derricks at Harlem River Bridge, 2 sheets.
Excavation and Back Filling.
Gate House at North End of Harlem River Bridge.
— Way in Croton Dam.
— in receiving Reservoir; Plan and Details, 2 sheets.
Gates, regulating; Plan and Details, 2 sheets.
Pile Driver, Harlem River Bridge.
Pipe Chambers, 2 sheets.
Pipes, Details of Iron—.
—, effluent—at Receiving Reservoirs, 2 sheets.
Reservoir, distributing; Plan and Details, 3 sheets.
—, receiving; Plan and Details, 2 sheets.
Tunnelling in Earth, Method of—.
Ventilators, 2 sheets.
Water Wiers; Plan and Details, 3 sheets.
Proposals for Cast Iron Water Pipes.
Delaware & Hudson Canal. Original Drawings of Structures, as follows:
— Aqueduct at Rondout, 2 sheets; over the Moneygamp and Neversink, 2 sheets.
— general Plan, 2 sheets.
Bridges, general Plan, 2 sheets.
Coal Dock at Rondout; Plan and Details, 2 sheets.
Dam, the Lackawaxen—; 2 sheets.
Foundations, plan of Piling—; 2 sheets.
Guard Lock at Eddyville, and in Delaware River, 2 sheets.
Lock Gates, Plan and Details, 4 sheets.
Locks, Plans and Details, 10 sheets.
Waste Weir.
Weigh-Lock at Eddyville,
From S. J. Kent, Phillipsburgh, N. J.:
Properties and Tables of Quarter Squares of Numbers.
From Kentucky State Commission, Louisville, Ky.:
General Account of the Commonwealth of Kentucky. (Several copies.)
From Keystone Bridge Co., Philadelphia, Pa.:
Bridges at Callowhill Street, Philadelphia;
Dubuque, Parkersburgh and St. Louis. 5 photographs.
From Lake Shore & Michigan Southern R. R. Co., Cleveland O.:
Annual Reports, 1st-6th. Cleveland. (Several copies of each.)
From Charles Latimer, Cleveland, O.:
Safety Switch, Safety Guard for detached Trains on Bridges, and Rail Splice. 3 models.
From E. D. Leavitt, Jr., Cambridge, Mass.:
Pumping Engines for Lawrence Water Works, 2 drawings.
From J. E. Lindberg, Philadelphia, Pa.:
Saby & Farmer's Model Safety Appliances for Railways. Photographs.
From Louisville Bridge & Iron Co., Louisville, Ky.:
Drawings of Tray Run Viaduct, 2 sheets.
Model of Fink's Suspension Truss Bridge.
Photographs, as follows:
Clay's Ferry Iron Bridge, Richmond & Lexington Turnpike.
Cumberland River Bridge, 2 sheets.
Green River Bridge.
Licking River Bridge.
Ohio River Bridge, at Louisville, Ky., 4 sheets.
From T. D. Lovett, Cincinnati, O.:
Report on the Construction of the Cincinnati Southern Railway.
From F. C. Lowthorp, Trenton, N. J.:
Plan, Elevation and Section of Lift Lock on upper grand Section of the Lehigh Navigation Canal Co. 1838.
From Charles Macdonald, New York:
Photographs of Iron Bridges, as follows: the Charlotte Draw, the Corning, Portage and Oswego Bridge; the Oak Orchard Viaduct and a common Road Bridge, 2 sheets each.
From Mackintosh, Hemphill & Co., Pittsburgh, Pa.:
Blowing Engines for Isabella Furnace. (Photographs of drawings).
From F. Martens, College Point, N. Y.:
Engine House, College Point Water Works, a tracing.
From Mason Machine Works, Taunton, Mass.:
Photographs of Locomotives, 4 sheets.
From Massachusetts State Board of Health, Boston, Mass.:
Annual Reports of the Board. 7 numbers.
Report on Metropolitan Main Drainage.
Sewerage of Boston.
Summary of 7 years' work of the Board.
From Massachusetts State Commission, Boston, Mass.:
Catalogue of Department of Education and Science.
— of Mass. Inst. of Technology, and of its Exhibit—2 numbers.
Report of Boston Public Library, 24th Annual—
— on Geological Maps of Massachusetts State. (4 copies.)
Reports of the Railroad Commissioners of Massachusetts State for 1875 and 1876. (Several copies each.)
From W. J. McAlpine, Babylon, N. Y.:
Water Works at Salem, Mass., a plan and profile, 1869.

From M. C. Meigs, Washington, D.C.:
Cabin John Bridge, Washington Aqueduct,
3 photographs.

From Michigan State Commission, Detroit, Mich.:
Catalogue of Products of Michigan. (4 copies.)
Educational System of Michigan. (5 copies.)
Sketches and History of Michigan. (5 copies.)

From G. S. Morrison, New York:
Map of Erie Railway and Profile of its Branches.
Photograph of the old Portage Bridge.*
Profile of Erie Railway.

From W. K. Muir, St. Thomas, Ont.
Model of Locomotive Head Light, showing
Flashes.

From A. F. Nagle, Providence, R. I.:
High Service pumping Engine, Providence
Water Works. Description, (copies for distribution), and photograph.

From W. L. Nicholson, Washington:
An Engraving of James Watt.

From E. P. North, Fordham, N. Y.:
Stereoscopic Views of 2 submarine Blasts, in
Abnapee Harbor, Wis.

From J. W. Nystrom, Philadelphia, Pa.:
French metric System, (2 copies.)
Steam Engineering.

From M. N. Oviatt, New Brunswick, N. J.:
View of New Brunswick Water Works, a
photograph.

From Charles Paine, Cleveland, O.:
Model of a Safety Car-Brake.

From G. W. Pearsons, Ogdensburgh, N. Y.:
Model of Stand-Pipe for Water Works.
Three Models of Lake Sailing Steam Vessels.
Pumping Machinery for direct Water Supply,
as constructed by the Holly Manufacturing
Co., 5 drawings.

From Pennsylvania Steel Co., Harrisburgh, Pa.:
Album of Shapes and Supplement.

From Philadelphia & Reading R. R., Philadelphia, Pa.:
Catalogue of Specimens of mineral and
agricultural Products, &c., from Line of
the Railroad, exhibited at the Centennial
Exposition, Philadelphia.
Model each of general Style of Highway and
of Railroad Bridge.

Parts of Bridges as follows: the Bottom
Screw, the Connections for Top and
Bottom Chords of an Iron Truss, and the
Skew Back and Washer for a wooden Truss.
6 pieces.

From Phoenix Iron Co., Phoenixville, Pa.:
Album of Shapes. (2 copies.)
Pocket Book for Engineers. (2 copies.)

From F. C. Prindle, Secretary American
Dredging Co., Philadelphia, Pa.:
American Dredging Co's Dredges and Pile
Drivers, described.
Drawings, Lithographs and Photographs of
Dredging and Pile Driving Machinery; a
portfolio.

From Railway Speed Recorder Co.,
Meadville, Pa.:

A Railway Speed Recorder, with Attachments
as used.

From R. W. Raymond, Brooklyn, N. Y.:
Address at Opening of Pardee Hall, Easton,
Pa. (2 copies.)

From L. F. Root, Westfield, Mass.:
Plans of Reservoir Gate House, a drawing.

From R. P. Rothwell, New York:
Topographical Contour Maps of Panther
Creek Coal Region and of Part of Wy-
oming Valley Coal Field.

From T. B. Samo, Washington, D. C.:
Lithographs of Constructions, Washington
Aqueduct, as follows:

Distributing Reservoir, Plan and Details,
5 sheets.

Gate Houses, Plan and Details, 6 sheets.
High Service, Details.

Main, Branches, &c., 5 sheets.

From Edward Sawyer, Boston, Mass.:
Two Boyden Fourneyron Turbines construct-
ed, one under Superintendence of Uriah
Boyden, for Atlantic Cott n Mills, and the
other of Edward Sawyer, for Saratoga Man-
ufacturing Co. 2 drawings of each.

From J. R. Scupham, San Francisco,
Cal.:
Loop Line on Southern Pacific R. R., in Te-
hachapi Pass, a photograph.

From J. H. Shedd, Providence, R. I.:
Relating to Providence Water Works as fol-
lows:

Blanks used for Returns of Inspectors &c.
Contracts and Specifications for Buildings,
(2 copies), for Cast Iron Water Pipes and
special Castings, Cornish Pumping En-
gine and for laying Water Pipes.

Communication from Chief Engineer and
from George H. Corliss, on Pumping En-
gine at Hope Station. 2 numbers.

Drawings of Cornish Engine and Flood
Gate, Hope Reservoir; Hydrant and of
Outlet Chamber, 5 sheets.

Reports of Water Commissioners, Nos.
1-16, including Reports on Sewerage, Nos.
1-8; also Quarterly Report, January 1st,
1873, 25 numbers.

Report of Water Commissioners and
George H. Corliss, relative to Pumping
Engines for Water Works.

— on Hope Reservoir.

— on Sewerage in Providence made by
the Water Commissioners, and Report by
Chief Engineer, February, 1874. (2
copies.)

— on Water Works and Sewerage of
Providence.

Stereograms of the Water Works, 10 cards.

From W. P. Shinn, Pittsburgh, Pa.:
Freight and Passenger Locomotives, made
by the Pittsburgh Locomotive Works. 10
photographs.

Railroad Transfer Table, a drawing.
Summit Tunnel, Alleghany Valley R. R. 5
drawings.

From Otto Sibeth, New York:
Central Park, New York; a topographical
map.

From J. Dutton Steele, Pottstown, Pa.:
Falls Bridge (near Philadelphia), Philadelphia
& Reading R. R.; a model.

From McRee Swift, New Brunswick,
N. J.:
Patent Water and Gas Pipe Co. of Jersey City.

* Subject to his order.

From Thomas Iron Co., Hokendauqua, Pa.:
Inclined Plane, hoisting Machinery and washing Machine for Iron Ores; a drawing.

From R. H. Thurston, Hoboken, N. J.:
Stevens' Battery; a descriptive pamphlet.

From Union Iron Co., Buffalo, N. Y.:
Album of Shapes.

From University of Michigan, Ann Arbor, Mich.:
Catalogue of University; (several copies).

From H. F. Walling, Boston, Mass.:
Series of Atlases and Maps, published by him.

From J. F. Ward, Jersey City, N. J.:
Water Pipe, Model of flexible-joint for crossing Streams.

From L. B. Ward, Jersey City, N. J.:
Inclined Plane, No. 12, East; Morris & Essex Canal; 3 photographs.
Water Pipe, 6-inch cast Iron, laid in Albany, 1813-15.*

From S. Webber, Manchester, N. H.:
Manual of Power.

From J. D. Weeks, Pittsburgh, Pa.:
Pittsburgh and Alleghany, Centennial; Year (5 copies).

From G. Whitney & Sons, Philadelphia, Pa.:
Steel Wheels; the Hamilton Steel Wheel Co. (3 copies.)

From Squire Whipple, Albany, N. Y.:
Girder of Cast Iron Girder Bridges used in England about 1846; a model.
Whipple trapezoidal Truss Bridge; a model, made in 1846.†

From Wisconsin State Commission, Madison, Wis.:
Sketches of Wisconsin and Catalogue of Centennial Exhibit, (copies for distribution).

From T. S. Witherbee, Port Henry, N. Y.:
Furnace at Cedar Point Iron Works; 2 photographs.

From H. R. Worthington, New York;
Report on the Worthington Duplex Pumping Engine, as applied to Water Works.
Water Works Pumping Engine used to supply Grounds and Buildings of the International Exhibition; a photograph.

THROUGH USUAL SOURCES.

From E. N. Beebout, Canton, O.:
Report of Joint Committee, Ohio Legislature, on the Ashtabula Bridge Disaster. Columbus. (Copies for distribution.)

From William H. Bell, Chicago, Ill.:
Map of Old City of New Orleans, and Details of present Drainage Operations.

From John B. Duncklee, Washington.
Specification for Improvement of Elizabeth River, Va. (3 copies.)

From C. Douglas Fox, London, Eng.
Boiler Insurance and Steam Power Co. (Chief Engineer's Report). Manchester, 1877.

Building Woods, Causes of their Decay and Means of Preservation. G. R. Burnell.
Durability of Materials. Edwin Clark. Minutes of Proceedings, Institution of Civil Engineers, Vol. XX, II. London, 1869.

Nature and Properties of Timber. Henry P. Burt. Minutes of Proceedings, Institution of Civil Engineers, Vol. XII. London.
Preservation of Wood in the Sea. A. Forester. (French), Paris. 2 vols. 1868.

South Indian Railways. Specifications for Sleepers. 1874.

From Maj. P. C. Hains, Eng. Secretary, Light House Board, Washington.
Annual Report of the Light House Board, for year ending June 30, 1876. (3 copies.)

From the Hanover Society of Architects and Engineers, Hanover, Germany:
Catalogue of the Library of the Society, Hanover. (German.)

Journal of the Society, Vol. 13, Part 1. Hanover, (German.) 1877.
Transactions of the Society, Vol. XXIII. (2 numbers.) Hanover, (German.)

From Hartford Steam Boiler Inspection Insurance Co., Hartford, Conn.:
Annual Report for 1876. Hartford, (2 copies).

From Charles H. Haswell, New York:
Engineers' and Mechanics' Pocket Book—new ed. Charles H. Haswell, New York.

From Gen. A. A. Humphreys, Chief of Engineers U.S.A., Washington.
Sixth Report on the Improvement of the South Pass of the Mississippi River. C. R. Comstock. Washington. (Copies for distribution.)

United States geological Explorations of the 40th Parallel, Vol. VI. Microscopical Petrography. Fred. Zoike. Washington.

From Institution of Civil Engineers, London, Eng.:
Elements and Observations as to Emission of Heat by hot Water Pipes. W. Anderson. Excerpts from Minutes of Proceedings. London.

Minutes of Proceedings of the Institution, Vol. XLIII. London.

From D. Kirkaldy, London, Eng.:
An Enquiry into the Properties of Essen and Yorkshire wrought Iron Plates. D. Kirkaldy. London. (3 copies.)

From Charles Latimer, Cleveland, O.:
Comparative Statement of Expenses in Engineering Department, Atlantic & Great Western R. R., February, 1876-7.

From W. H. McFadden, Chief Engineer Water Works, Philadelphia, Pa.:
Topographical Maps of Philadelphia, showing Water Mains and Street Grades. Philadelphia, 1877.

From F. Rinecker, Liestel, Switzerland:

* The first pipe of its size and length laid, and is said to be the first cast, in this country. In casting, the mould was vertical, with hub or bell end down; the spigot end is tapered. 300 tons were laid, forming a continuous circuit of 3 miles, and a portion still is in use as first laid.

† This is believed to illustrate the first intelligent attempt to introduce, from actual calculation, correct proportions for the several parts in bridge trusses or girders, according to the duty required of each part and to reduce the material employed, to a practical minimum.

- American Railroads, G. F. Poissin, Paris. (French.) 1836.
- Baltimore & Ohio R. R. illustrated. Carl Ghega, Vienna. (German.) 1844.
- From Royal United Service Institution. London Eng.:
- Journal of the Institution. Nos. LXXXIX, XC. London, 1877. (2 numbers.)
- From the Saxonian Society of Engineers and Architects. Dresden, Saxony:
- Minutes of the Society. Dresden. (German.)
- From T. S. Sedgwick. Washington.
- Letters from Secretary of War, on the following—(several copies):
- Information upon Constructing a Harbor of Refuge from Ice Floods, at Mill Bottoms. Navigation of the Mississippi River.
- Settlement with James B. Eads; Papers and Documents relating to Improvements of South Pass Mississippi River.
- Message from President of the U. S. relating to Boundary Line between United States and British America. (2 copies.)
- Reports on the following—(2 copies each):
- Management and Repairs of Louisville & Portland Canal. G. Weltzel.
- Survey of central Route from Ohio or Kanawha River to Tide Water in Virginia. W. P. Craighill.
- Survey of Union and Central Pacific Railways.
- From Society of Civil Engineers, Paris, France:
- Memoirs and Account of Operations of the Society; November. December, 1876; January, February, 1877. 2 numbers. (French.)
- From Society of Civil Engineers, Stockholm, Sweden:
- Index to Proceedings of the Society. Vols. I-X. (Swedish.) Stockholm, 4to.
- Proceedings of the Society. Vol. XL. Parts 1-4. (Swedish.) Stockholm, 4to, illus., 1876.
- From Thomason College of Civil Engineering, Roorkee, East India:
- Professional Papers on Indian Engineering, Vols. I, III, V; 1872-74-76.
- From R. H. Thurston, Hoboken, N. J.:
- Rate of Set of Metals, subjected to Strain for considerable Periods of Time.
- Resistance of Materials as affected by Flow and by Rapidity of Distortion. (German: 4 copies.)
- From John C. Trautwine, Philadelphia:
- Civil Engineer's Pocket Book. Rev. ed. Philadelphia.
- From J. N. Tabbs, Rochester, N. Y.:
- Annual Report of executive Board in Charge of Departments of Water Works, Fire, Highway and Street Improvements of Rochester, for 1876.
- From D. Van Nostrand, New York:
- Boiler Incrustation and Corrosion. F. J. Rowen.
- Practical Treatise on the Properties of continuous Bridges. Charles Bender.
- Steam Injectors; their Theory and Use. L. Poche.
- Transmission of Power by Wire Ropes. A. W. Stahl.
- From G. K. Warren, Major of Engineers U. S. A., Newport, R. I.:
- Geographical Survey in United States. Remarks on J. D. Whitney's Article in North American Review, 1875, with Account of Organization of the Pacific Railroad. G. K. Warren. (Copies for distribution.)
- From Rudolph Wieser, Cincinnati, O.:
- Kentucky River Bridge, Cincinnati Southern Railway. (2 Photographs.)
- From John Wiley & Sons, New York:
- Elements of Geometry. G. M. Searle. New York.
- Strength and Determination of Structures of Iron and Steel. J. J. Weyrauch. Trans. by A. J. DuBois. New York.
- From unknown Donors or by Purchase:
- American Library Journal. (Monthly.) Vol. I. Nos 1-8. New York.
- Annals of the Minister of Construction, of the Republic of Mexico. Vols. I, II. (Spanish.)
- "Appalachia." Annual Address of the President of the Club. Boston.
- Arches. Treatise on the Construction of oblique—. John Hart. London, 1836.
- Bridge. Machines used in the Construction of Backfairs—. London.
- Dredge's Suspension—explained upon the Principles of the Lever. W. Turnbull. London 1841.
- of Santa Trinita over the Arno at Florence. London. 1822.
- Wooden—on Stone Piers, at Ivory. H. C. Emmery. (French.) Paris, 1832.
- Bridges. Practical and theoretical Essay on oblique—. G. W. Buck. London, 1839.
- Memoir on Suspension—. C. S. Drewry. London, 1832.
- Memoir on Suspension—and on the Bridge des Invalides. M. Seguin. (French.) Paris. 1820.
- Buildings. Laws relating to—, with Glossary of technical Terms. Chambers & Tattersall. London, 1845.
- Calcareous Cement and the Preparation of Quick-Lime. Experiments to improve—. B. Higgins. London, 1789.
- Canal of the Province of Languedoc. (French.) Paris. 1871-74.
- of the Seine. Navigation of—M. J. Cordier. (French.) Paris, 1820.
- Canals. Description of the St. Denis and St. Martin—. R. D. de Villelars. (French.) Paris. 1826.
- Memoirs on the Locks of—.(French.) Paris. 1825.
- of Great Britain. John Carey. London, 1795.
- of Orleans. Briare and Lonig. (French.) Paris.
- Report to the King on the Condition of—. (French.) Paris, 1829.
- Tables for Calculations or Formulas relating to the Movement of Water in Canals. R. de Prony. (French.) Paris, 1825.
- Cannon. Fabrication of—. G. Monge. (French.) Paris. 1794.
- Carpenter and Joiner's Assistant. P. Nicholson. London, 1826.
- Carpentry. Principles of—, a Treatise on the Pressure and Equilibrium of Timber Framing. Resistance of Timber and Construction of Floor, Roofs, Bridges, &c. T. Tredgold. Philadelphia, 1817.
- Catalogue of Library of Peter Hastie and Edward H. Tracey. New York, 1877.
- Changes in Prices of the Precious Metals. Henry C. Carey. Washington.
- Dam at Cherbourg. J. M. F. Cochlin. (French.) Paris. 1820.

- Dictionary of technical Terms. (French and English.) J. de Bague. Paris. 1873.
- Directory of Presidents, Superintendents, Master Car Builders, Master Mechanics and Masters of Car Repairs and of Car Manufacturers. New York.
- Dry Rot. Origin and Operation, its Prevention and Cure. R. McWilliam. London. 1818
- Eulogy on Edward Everett. T. T. Davis. Syracuse. 1865.
- Fast Freight Transportation, the American System of—. Philadelphia. (2 copies.)
- Foundations; (submerged)—of hydraulic Works. L. A. Baudemoulin. (French.) Paris. 1829.
- Fuel. Experiments on—to determine comparative Values of the principal Varieties. M. Bull. Philadelphia. 1827.
- Harbor Commissioners. Annual Report of the Board of—, Boston. 1877.
- Heliotype Process. Boston.
- Hydraulics. Researches in—. M. Darcey & Bazin. 4 vols. (French.) Paris. 1865.
- Hydraulic Works at maritime Ports. Construction of—. W. Minard. 2 vols. (French.) Paris. 1846.
- Internal Navigation of the United States, G. Armroyd. Philadelphia. 1830.
- Limes, calcareous Cements, Mortars, Stuccos and Concrete. C. W. Pasley. London. 1838.
- Machine Construction, scientific and practical Method of—. F. Redtenbacher. (French.) Paris. 1868.
- Machinery. Elementary Treatise on—. M. Hatchette. (French.) Paris. 1819.
- Mechanics. Plates to Treatise on—. Chev. de Gerstner. London. 1834.
- Marine Surveying and Hydrometry. Application of—to the Practice of Civil Engineering. David Stevenson. Edinburgh. 1842.
- Mt. Washington Railway. Photograph of a Section showing Curve and Trains.
- Photo-Engraving Co. Quarterly Circular. 1876.
- Pump, improved automatic—. Circular of Hartford Pump Co.
- Railway Commission, Irish—Plans and Sections of the several Lines of Railway. 2 vols. with atlas. London.
- System. History and Prospects of—. Gauge Evidence. S. Sidney. London. 1846.
- Railways. Service of the Material and rolling Stock of the Southern—in Austria, during 1872-75. M. A. Gottschalk. (French.) Paris. 1876.
- Treatise on—explaining their construction and Management. P. le Count. Edinburgh. 1839.
- Repertory of Patent Inventions and other Discoveries and Improvements in Arts, Manufactures and Agriculture. Enl. Series from Commencement. 40 vols. London. 1843-63.
- Roads. Practice of making and repairing. T. Hughes. London. 1838.
- Treatise on—, the Principles on which they should be made, as applied by T. Telford on the Holyhead Road. H. Parnell. London. 1833.
- San Francisco municipal Reports for year ending January 30, 1876. San Francisco.
- Telegraphic Railways, or the Signal Way, recommended for Safety, Economy and Efficiency, under the Safeguard and Conduct of the electric Telegraph. W. F. Cooke. London. 1842.
- Water Supply Materials. Catalogue of—. A. J. Corcoran.
- Supplies for San Francisco. Proceedings and Reports. San Francisco. 1875.
- Works in America, the first—a historical Sketch of the Bethlehem Water Works. Robert Iton. 1877.
- Wind Engine. Catalogue of the U. S.— and Pump Co.
- Circular of Stover's Automatic—.
- Mill. Circular of the Eclipse. Beloit.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: regular meetings, when ballots for members will be canvassed and other business done, Thursday, July 12th,* and Wednesday, September 5th; and a stated meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, June 20th—each at 8 o'clock P. M.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held July 12th,* and

* The first Wednesday of July being Independence Day, this meeting is postponed as stated.

Wednesday, August 1st, and September 6th, at 3 o'clock P. M.

No regular or stated meetings of the Society will be held from July 12th to September 5th.

PAPERS HAVE BEEN PRESENTED to the Society, since the last announcement, as follows: American Society of Civil Engineers and its Future.

W. Milnor Roberts.....April 25th, 1877.
Brush Dams.

E. P. North.....May 11th, 1877.
Cushioning the reciprocating Parts of Steam Engines.

John W. Hill.....May 23d, 1877.

Description of a Design for a Steam Vacuum Pump.

William H. Lotz.....June 7th, 1877.

Description of recent Tests of the new Iron Bridge over the Kentucky River on line of the Cincinnati Southern Railway.

L. G. F. Bouscaren.....April 25th, 1877.

Details of Methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf.

E. L. Corthell.....April 25th, 1877.

Failure of Ashtabula Bridge. Discussion:

Thos. C. Clarke, March 20, 1877.

Robert Briggs, " 25, "

Charles Hilton, " 30, "

Theodore Cooper, April 4, "

C. Shaler Smith, " 24, "

Flow of Water in open Channels.

Theodore G. Ellis.....April 20th, 1877.

Improvement of Entrance to Galveston Harbor.

C. W. Howell.....April 24th, 1877.

Memoir of Life and professional Services of the late George W. R. Bayley.

C. G. Forshey, Chairman, April 25th, 1877.

Novel Railroad Survey.

Thomas S. Hardee.....April 25th, 1877.

Patents and Patent Laws, Inventions, Inventors and Authors.

C. G. Forshey.....April 25th, 1877.

Preservation of Timber. Discussion:

C. Douglas Fox.

C. B. Sears... May 25, 1877.

Relative Quantities of Material in Bridges of different Kinds and of various Heights.

C. E. Emery.....April 24th, 1877.

Report of Committee on Tests of American Iron and Steel.

W. S. Smith, Chairman...April 24th, 1877.

Report of Committee on the metric System of Weights and Measures.

C. Herschel, Chairman, April 25th, 1877.

Results of recent Test Levels on the Line of the Erie Canal.

W. H. Searles.....April 25th, 1877.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The conditions of award are set forth in the Code of Rules heretofore published in the Journal; a copy will be furnished to applicants.

No award having been made last year, it is announced that, under Rule VI. two premiums are offered for the coming year, one being a gold medal for the best paper, and

the other, books (costing \$70 currency), for the second best paper, competing.

PAPERS ON ENGINEERING SUBJECTS, giving results of practice, or in discussion of pertinent theoretical questions, are desired from members of the Society; their comments (whether or not present at meetings of the Society), upon papers published in Transactions, are solicited, and they are urged to contribute from note-books and other similar records, whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, Vol. I.

RATES OF POSTAGE on transient matter sent to the Society from domestic post-offices, except New York, are as follows:

On books, pamphlets, periodicals, maps and corrected proof sheets, *one cent per two ounces*; on photographs, lithographs, and engravings, *one cent per ounce*; and on letters and other mail matter, either wholly or partly in writing (except corrected proofs), sealed packages, or those wrapped so as not to be conveniently examined without destroying the wrapper, *three cents per half ounce*. The sender may write or print his address in or on a package, and state names and number of articles enclosed, without extra charge.

Matter upon which not enough postage is prepaid, is charged on delivery with *once or twice* the deficiency, according to class; and it is not infrequent that from \$0.50 to \$5.00 is thus charged.

The attention of members is called to these conditions. Generally, it is better to forward a package by express when the postage thereon exceeds \$0.35, or the rating is uncertain.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from 9 o'clock, A. M. to 5 o'clock, P. M. each business day, except Saturday, when they are closed at 3 o'clock, P. M. Members desiring admission outside these hours, are requested to apply to the Secretary.

LIST OF MEMBERS.

ADDITIONS.

Date of Election.

HARDEE, THOMAS S.....	Chief Eng., Louisiana Levee Co., New Orleans, La.....	April 4, 1877.
HARROD, BENJAMIN M.....	Architect and Ass't City Eng., New Orleans, La.....	" " "
HILLMAN, CHARLES F.....	Civil Engineer, Chili, S. A.....	July 5, 1876.
KEEFER, THOMAS C.	Ottawa, Can.....	April 4, 1877.
LE CONTE, LOUIS J.....	Res. Eng. in Charge of Harbor Improvements, Oakland, Cal.....	" " "

CHANGES AND CORRECTIONS.

BAXTER, GEORGE S.....	227 Lexington av., New York.
BISSELL, H.....	East Windsor, Conn.
BOGUE, VIRGIL G.....	Care Henry Meiggs, Lima, Peru.
BRIGGS, ROBERT.....	220 S. Fourth st., Philadelphia, Pa.
BRODHEAD, CALVIN E.....	Hickory Run, Carbon Co., Pa.
BROWN, ROBERT N.....	Care Maj. Whitney, Niagara Falls, N. Y.
BUCK, LEFFERT L.....	Care Col. W. H. Paine, Pier 29, E. R., New York.
FRANCIS, HENRY N.....	Ass't City Eng., 35 N. Main st., Providence, R. I.
GUNN, OTIS B.....	Lawrence, Kansas.
HORTON, SANDFORD.....	Ass't Eng., Albert Lea Extension, B. C. R. & N. R'y, Northwood, Worth Co., Iowa.
KNIGHT, WILLIAM B.....	240 E. Seventy-seventh st., New York.
RICE, EDWARD C.....	3631 Baker av., St. Louis, Mo.
ROBERTS, W. MILNOR.....	Middleton, Annapolis Co., Nova Scotia.
STAUFFER, DAVID M.....	127 S. Thirteenth st., Philadelphia, Pa.
STUCKLE, HENRY W.....	Care W. E. Worthen, 63 Bleeker st., New York.
SWAN, CHARLES H.....	35 N. Main st., Providence, R. I.
WEIR, FREDERICK C.....	507 W. Seventh st., Cincinnati, O.

DECEASED.

NICKERSON, LOUIS.....	Baltimore, Md.....	May 6th, 1877.
-----------------------	--------------------	----------------

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. July, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JUNE 20TH AND JULY 4TH, 1877.—A quorum not being present, the meetings were adjourned.

OF THE BOARD OF DIRECTION.

JUNE 20TH, 1877.—An adjourned meeting was held at three o'clock P. M.; proposals for admission to membership were considered.

JULY 2D, 1877.—A special meeting was held at three o'clock P. M.; proposals for admission to membership were considered.

Messrs. William E. Worthen, J. James R. Croes and G. Leverich were appointed a committee to arrange and furnish the Society's rooms.

Attention was called to resolutions adopted at the Ninth Annual Convention, relating to a metric standard of weights and measures;* the best system of weights and measures for the use of engineers;† the reading of papers on engineering subjects at Annual Conventions,‡ and the division of Conventions into sections;§ and under By-Laws, Section 30, Messrs. Theodore G. Ellis, J. James R. Croes and Matthias N. Forney were appointed a committee to report for each, a form of letter ballot with such statements as shall succinctly set forth the reasons for and against the proposed action.

JULY 4TH, 1877.—In absence of a quorum, the stated meeting was not held.

* Page 47.

† Page 48.

‡ Page 51.

§ Page 52.

REPORTS OF COMMITTEES.

ON TESTS OF AMERICAN IRON AND STEEL.

PRESENTED APRIL 25TH, 1877.

In behalf of the Committee on Tests of American Iron and Steel, I have to submit the following report:

On December 22d, 1876, the Chairman of the Committee addressed a letter to Gen. U. S. Grant, then President of the United States, requesting him "to direct the Secretaries of the Treasury, War and Navy, to report the opinions of the Chiefs of their several Departments on the practical benefits to be expected to be realized from the labors of the Board appointed to test Iron, Steel and other Metals when it has entered fairly upon its work." A copy of this letter is herewith submitted.* Such directions were given to the Secretaries, by the President, and most favorable opinions were returned by the heads of some of the Departments. Whether all replied or not, the Committee has not learned.

The President also addressed a special message to Congress, very clearly setting forth

**To the President of the United States:*

Sir,—The testing machine for the use of the Board appointed to test American Iron, Steel and other Metals, will, it is now thought, be completed and ready for use by February 1st next. It will be, as we believe, by far the most accurate machine ever employed in testing metals.

The Board has planned an inquiry that will be, if properly carried on to completion, comprehensive and exhaustive, surpassing in useful results, any similar investigation ever made by this or any other government. The value and importance of this work may be ascertained and set forth to some extent beforehand. And in order to do this, we would respectfully request that you direct the Secretaries of the Treasury, War and Navy, to report the opinions of the Chiefs of their several Departments on the practical benefits to be expected to be realized from the labors of the Board appointed to test Iron, Steel and other Metals when it has entered fairly upon its work with the excellent machine now nearly completed and ready for its use, and that the views of these Chiefs of Departments shall be given in full without delay.

We will cheerfully explain the plans adopted by the Board for carrying on its tests and investigations to the Chiefs of Departments, whenever invited to do so, without any cost to the government.

The interest heretofore manifested by you in the work of the Board, so nearly related as it is to most of the great industries of the country, has encouraged us to make the above request.

Very respectfully,
WM. SOOY SMITH,
Chairman.

the value and importance of the work undertaken by the Board. This was also done, by memorials and resolutions adopted by various scientific societies, and by the faculties of many of the leading universities, colleges and technological institutions of the United States, as already stated in a former report*—so that Congress has been fully informed of the nature of the work proposed, and it has been urged in every legitimate way open to the Committee, to make the necessary appropriations to carry it forward.

The clause of the Civil Appropriation Bill,† making an appropriation of something over \$19 000 for the use of the Board, during the present fiscal year, contains a provision that the Board shall cease to exist when that appropriation has been expended.

It was hoped and believed that the desire for additional knowledge of the characteristics of iron and steel, awakened by the Ashtabula disaster, would induce Congress to repeal so much of the bill referred to, as provided for the discontinuance of the Board, as above stated, and make such further appropriations as the Board might require, to finish its labors. But partly owing, no doubt, to the intense political excitement consequent upon the presidential election, and the deep anxiety that was caused by the uncertainty of the result—it was impossible for this Committee to get any favorable consideration by Congress of the matter with which it is charged by the Society.

After a great deal of fruitless effort, we succeeded in getting a clause introduced in the "Sundry Civil Bill," in the form of a Senate Amendment, appropriating \$40 000 for the use of the Board, and repealing the hostile clause of the previous bill. The Senate and House found it necessary to appoint a conference committee to fix the provisions of the bill, and the Senate receded from the amendment making our appropriation and saving the life of the Board.

It will thus be seen by the members of the Society, that the Board will cease to exist before its labors are fairly begun, and the work to which many of us have given such earnest attention and from which we have anticipated so much that would be beneficial to us as en-

* Vol. II, page 155. † Vol. II, page 100.

gineers, and to the country at large, must be dropped before it has yielded more than a tithe of the fruits it has promised.

The Committee considers it unnecessary to more than merely allude here, to the want of knowledge of the characteristics of the new varieties of iron and steel offered for our use, of which we are all so painfully conscious, to bring the mind of each member of the Society to a realization of the value of the knowledge which seems just within our grasp. Shall we fail to attain it?

We beg each member to put this question to himself. There is not a member of Congress of the United States who cannot be reached through some member of our Society, who is personally acquainted with him.

Let us make a vigorous effort at once to get Congress to repeal the legislation discontinuing the Board when the money already appropriated has been expended, and to appropri-

ate the money which the Board may need to enable it to complete the very valuable work it has undertaken.

The Committee has spared no effort to secure the aid of our government to carry forward the investigations in which we all feel so deep an interest. The civil engineers on the Board work without pay and have given much valuable time to this service. Does not the entire Society owe it to the Committee and to the Board to make the effort here suggested at once and with a zeal that must make it successful? The Committee confesses its inability to do any more than has already been done by it, without the aid of the whole Society; and this must be given at once, or the effort of the Society to induce our government to do a noble work must end in absolute and ridiculous failure.

Respectfully,
WM. SOOT SMITH,
Chairman.

OF THE CENTENNIAL COMMISSION OF THE SOCIETY.

PRESENTED APRIL 25TH, 1877.

The labors connected with the close of the Exhibition and the work found necessary afterwards, both in Philadelphia and New York, in properly distributing, packing and returning to their destinations, the various exhibits made under the auspices of the Commission, have proved as arduous as any which the Secretary has undertaken.

When the exhibits were received at the opening of the Exhibition, the cases in which they were packed were taken in charge by the Exhibition authorities and stored in sheds outside the grounds. No other arrangements were permitted. 130 boxes were thus taken away from us and stored. At the end of the Exhibition, only 11 boxes were returned, the fire which occurred during the summer being credited by the Centennial authorities with all that were missing. It thus became necessary to provide proper cases in which the exhibits could be packed, for return to their owners, or to the Society rooms. It is believed that all the articles have been safely transported. Much correspondence has been requisite in this work.

In order to secure for the Society, the advantage of permanent use of as much of our exhibit as possible, the following circular was prepared and sent to our exhibitors:

"Philadelphia, November 3d, 1876.

"At the close of the Exhibition, this Commission is preparing to return to the owners, or to the rooms of the Society, the various ex-

hibits. One of the advantages which has been anticipated from the work of the Exhibition, is the increase of the permanent collection of the Society, and this Commission hopes that as many of the exhibits as can be spared by the owners, will be donated to the Society.

"Will you please, by return mail give directions as to the disposition to be made of your exhibit."

The response has been very gratifying, and we have received and transferred to the permanent collection of the Society, a valuable amount of interesting material which has been donated by American exhibitors under our auspices. The exhibits so donated are 1328 in number, and illustrate nearly all branches of engineering. A catalogue of these donations has been prepared for printing.*

During the Exhibition and after its close, care was taken to secure from foreigners exhibiting material of interest to engineers, such donations as were to be obtained. In this effort we have been successful, and have received and transferred to the Society for its permanent collection, 474 separate exhibits donated from various countries. Among these, should be specially mentioned, the exhibits of the Austrian Society of Engineers and Architects, received by the Commission through Mr. Ernest Pontzen, an Austrian Imperial Commissioner and a member of our

* See Additions to Library and Museum, page 59.

Society; also the engineering exhibit of the Swiss Republic, received by the Commission through Mr. Edward Guyer, Swiss Federal Commissioner. Both of these exhibits, are of very decided engineering interest; many of the contributions from other countries are also valuable. A catalogue of these donations has been prepared for printing.*

In order to reciprocate to some extent, the kindness shown in the donation of these foreign exhibits, a collection has been made by the Secretary, of over 500 lithographs, photographs, albums, etc., illustrating various American engineering works, and these are to be forwarded to the foreign gentlemen or societies, from whom donations were received.

The general exhibit made under the auspices of our Commission in the West Gallery of the Main Building, and in our two spaces in Machinery Hall, comprised 1900

separate exhibits, duplicates not being included in this number. These exhibits included:

65 framed pictures;
160 models, full sized machines, connections and special parts;
450 separate photographs;
35 albums of photographs and plates;
309 books;
130 manuscript memoirs;
743 plans, maps and drawings.

The Commission has taken measures to secure through its sub-committees, memoirs upon the various engineering subjects illustrated at the Exhibition or connected with the history and progress of engineering in the United States. It is hoped that these may be finished and published during the present year.

JOHN BOGART, THEO. G. ELLIS,
Res. Secretary. Chairman.

ON QUARTERS FOR THE SOCIETY.

Presented April 25th, 1877.

The Committee upon Quarters for the Society reports, that after considerable deliberation upon the subject of the best provision for a future home for the Society, the following circular was adopted and sent to members:

"NEW YORK, February 28, 1877.

"The Committee appointed to provide quarters desires to lay before the Society the following points:

"The lease of the present rooms expires on May 1st. and the rent has been raised \$400. The constant additions to the library, and particularly the large amount of valuable exhibits acquired through the Centennial Commission, render more space necessary than the present rooms afford. The material from the Exhibition has been stored, as there is really now no place to put it. To obtain sufficient space adjacent to the present rooms, would add \$1200 to the rent now paid.

"It is considered very desirable that a house should be secured for the permanent home of the Society. If this can be effected, a release will be afforded from the constant drain of a heavy rental, and many other advantages will be assured.

"At this time, real estate can be bought at very low figures. After an examination as to available houses, the Committee has come to the conclusion that a voluntary

subscription of an amount equal to the dues of each member for one year, would warrant the purchase of a suitable house.

"As it is necessary to decide the question very soon, this means is taken of presenting it to you. Will you, therefore, reply to this circular, per blank annexed, at once (answers to be canvassed before March 15th), stating whether you agree with the proposed movement, and whether you will subscribe the amount of one year's dues, or more. (It is not intended to limit the amount of subscription.)"

The response to this circular, has been quite full, and the expression of the great majority of the answers is decidedly in favor of the purchase of a suitable house for permanent occupation. Upon full consideration, it has been decided that such a purchase was too important a matter to allow the slightest danger of mistake.

Two distinct questions are to be solved. 1st.—The best means of securing a fund sufficient to provide the quarters most desirable. 2d.—The determination as to the quarters, with reference to the location, size, price to be paid and future necessities of the Society. Various solutions of these questions have been discussed, and it has been thought best by the Committee, that the Society should take more time than would elapse before its present lease expires. As the rent of its present rooms, has been largely increased, and as the rooms are really too small, a com-

* See Additions to Library and Museum, page 67.

modious house in an excellent location, 104 East Twentieth Street, has been rented, for the present, for the same rental the Society has paid for its rooms during the past two years.

The Committee deems it for the best interests of the Society that the movement for a permanent home, either by purchase of or

by building a house, should be continued, and the report recommends that this work be carried forward as speedily as is consistent with an assurance of the best result.

Respectfully,

JOHN BOGART,
Chairman.

NOTES AND MEMORANDA.

REPORTS OF MEETINGS.

ADDRESS OF W. MILNOR ROBERTS, at opening of the Ninth Annual Convention.

The Convention was called to order at 10.30 o'clock A. M., April 24th, by John Bogart, Treasurer of the Society, who announced that W. Milnor Roberts would, as representing the Board of Direction, make an address.

MR. ROBERTS said: In the absence of the President and Vice-Presidents, I am requested, as a member of the Board of Direction and past Vice-President, to open the Convention, and to aid, so far as I can, at the business meeting of the Convention.

You will agree with me that this short notice, under the circumstances, can only call for almost impromptu remarks—such as could be jotted down at brief intervals in the cars, when traveling at the rate of 35 miles an hour, more or less, over 1 800 miles of railroad. I must therefore crave the indulgence of the members for attempting to throw together in such a crude manner, a few thoughts for the occasion of this, our Ninth Annual Convention, which for good reasons, the Society decided should be held in the city of New Orleans.

It is our custom to hold these Annual Conventions in different cities, and in different States of the Union; partly because of the cosmopolitan character of civil engineers and especially of our cosmopolitan membership, and partly to afford an opportunity for extending our intercourse socially as well as professionally among our friendly fellow-citizens.

New Orleans was selected for our Society re-union this year—*first*, for the reason that we have never met as a Society in this portion of our extensive country; *second*, because there is a very important engineering problem now undergoing solution in this vicinity—namely, the improvement of the South Pass of the Mississippi by means of jetties; *third*, because there are other engineering works and operations of great public interest going on near here under the auspices of the general government, and also

under the state government: and *last*, though not least, because we were assured by those of our members who reside in this city, and who, it is presumed, ought to know, that we should meet with a friendly welcome.

These were some of the considerations which have led to our coming here at this time. But from this bare reference to the inducements, we may get an inkling of what may agreeably engage our attention, professionally and otherwise, during our visit.

There are too, many historical associations connected with the names of Louisiana and New Orleans which are familiar to all. There are others, doubtless, the particulars of which, if called for, will be cheerfully given to us by our resident friends. I will content myself for the moment by recalling only one well known event—the Battle of New Orleans; and its hero, General Jackson, who, as history says, saved this fair city from the ravages of Pakenham's army.

Although party politics are not admitted into the discussions of our Society, yet, as individual members of one common country, we cannot but feel gratified that our present visit happens to be simultaneous with the peaceable settlement of important public questions, affecting not only the welfare of the State of Louisiana but of the entire Union. Peace hath her victories, now war "hath smoothed his wrinkled front," and the "engineer," instead of being "hoist with his own petard," is engaged in harnessing the mighty Father of Waters, curbing his mouth, directing his course and regulating his speed; and, to change the metaphor, making him work his passage out to sea.

Some of our members who are familiar with the sources of the Mississippi in Montana, Dakota, Minnesota and elsewhere, have never before had an opportunity of seeing all its vast accumulation of waters—the drainage of a million and a half square miles—concentrated in a single channel, half a mile wide; averaging, when in flood, 150 feet deep,

flowing at the rate of 4 miles or more per hour, presenting a cross-section of 400 000 square feet, and a flow of 140 000 000 cubic feet per minute. These are, of course, only round numbers, to give a general idea. The high water or flood line is 15 feet above low water at New Orleans. In such a flood, there is, of course, a fall of 15 feet in about 120 miles, to the Gulf, in excess of the low-water plane—an average of $1\frac{1}{4}$ inches per mile.

Every engineer will recollect Brinley's opinion that "rivers were made to feed navigable canals," but modern experience shows that in many cases, *railroads* have been made to supersede canals, which, as an old canal engineer, I think was naughty, though they never supersede navigable rivers; in fact, the prime mission of railroads everywhere, is to bring freights of all kinds to navigable waters, in order that they may be transported thereon at cheaper rates. But for ocean facilities, we could not send our surplus grain to Europe, on account of distance and the railroad charges that would arise. Hence the farther inland upon this continent we can extend deep navigation for ocean-going vessels, the better for the world's commerce. As a natural corollary, the whole world is interested in securing a deep sea entrance into the Mississippi river through the bar at its mouth. And this is the great engineering problem to which the attention of our members will be especially called at this time.

This is perhaps, enough of hydraulics for a start. Besides, I see before me, a member who must be a near relative of the Father of Waters, as he is certainly the father of hydraulic investigation in this country and in this Society, James B. Francis. And furthermore, we have members in this city, among them Caleb G. Forshey, Charles W. Howell, Elmer L. Corthell, James B. Eads and others, who can lead you down to the guards with river information of every description.

While we regret, that many who wished to be present at this Convention have been prevented from attending, we may still congratulate ourselves upon the number who are here; some having come more than 2 000 miles from points in New England, and some from St. Paul, Chicago, St. Louis, etc., and other far off places in the interior; but the great benefactor of this continent, the Father of Waters, has coursed his way from the picturesque nooks among the Rocky Mountains for 4 400 miles to reach this pleasant place of rendezvous, in the city of New Orleans.

There are objects of great interest in this

city and its surroundings which will be more particularly referred to, by the members resident of New Orleans. One of the most striking, is the relative height of the river and the city (the river being higher than the city), and the methods adopted for draining the city into Lake Pontchartrain. Then there is the levee system, which has long commanded the earnest attention of engineers and of the interested States, as well as of the national government. When I say interested States, I mean every state, and each one in every state, single or matrimonial; all, without exception, are interested in having the great parent river kept within proper bounds, and made more and more useful as he descends into the vale of years, or the gulf of Mexico.

I at first believed that this would be a proper paragraph at which to stop my train of thought; but as we bowed along, sometimes at the rate of over 50 miles an hour, a few other thoughts sprang unbidden, and seemed worthy of jotting down—such as our statistics of membership. Our beginning as an organization dates from 1852; but in 1855, it went into a Rip Van Winkle doze, and did not wake for twelve years; so that its real, live start was only about ten years ago, in 1867, when about 50 members were enrolled. We now have* in all 580, of which number there are 440 Members, 45 Juniors, 16 Associates, 6 Honorary Members, 70 Fellows, and 3 Corresponding Members, and these hail from all quarters of the Union, and from Europe and South America and Canada.

With a few words more, I will conclude. It is customary to make thankful mention of favors received, at the close of our proceedings. This will doubtless be done; but in behalf of a large number of members and others who have partaken of the liberality and kindness of the several railroad companies between New York and New Orleans and especially of the gentlemen in charge between Louisville and Mobile, at Mobile, and between Mobile and New Orleans, I can but thank them for their kind courtesies and abundant provision for our comfort.

Now without further amplification, and with the understanding that our Society comes here to learn and not as a teacher upon this occasion, I beg leave respectfully, in accordance with custom, to suggest the name of a Member, an old resident of the city, as the presiding officer of the Convention, Caleb G. Forshey.

* See Report of Board of Direction, November 1st, 1876, Vol. II., page 138.

ENGINEERING AND TECHNOLOGY.

- Agriculture, tropical.—, a Treatise on the Culture, Preparation, Commerce and Consumption of the principal Products of the vegetable Kingdom. P. L. Simmonds. London. 8vo. *Spons.* (New York). \$8.00.
- Air, the Production and Use of compressed —, in Mining Operations. M. F. L. Cornet. Philadelphia. 8vo. *Franklin Institute*.
- Antelope and Deer of America; a comprehensive Treatise upon the Characteristics, Habits, Affinities and Capacity of Domestication of Anilocapra and Cervidae of North America. John D. Caton. New York. 8vo, illus. *Hurd & Houghton*. \$4.00.
- Architecture, Notes on Irish —. Earl Dunraven; ed. by St. Kes. 2 vols, London, 4to, illus. *Bell & Sons*. Vol. II. 84s.
- Arms and Armor, from the earliest Period to the present Time. A. Demuin; trans. by C. C. Black. (Bohn's Artist's Library.) London. 12mo, illus. *Bell & Sons*. 7s. 6d.
- Art Anatomy. William Rimmer; comprising 486 Designs on 81 Heliotype plates, illustrating every Portion of the human Figure, with descriptive Text. Boston, 4to. *Little, Brown & Co.* \$50.00.
- Education applied to Industry, with Descriptions of Industrial Art in the Middle Ages; the different Systems of Art Education in Europe, and that best adapted to the United States; and industrial Art at the Centennial Exhibition. George Ward Nichols. 8vo, illus. *Harpers*. \$4.00.
- Treasures of Art, Industry and Manufacture represented at the International Exhibition, 1876. Ed. by C. B. Norton. In 25 parts. Parts I. II. Philadelphia. *Clay, Clegg & Co.* Per part. \$2.00.
- Battles of Columbe-Nouilly and Vionville, practical Studies of —, comp. and arran. from official Accounts by Lonsdale A. Hale. (British Gov. Publication.) London. 8vo. 4s. 6d.
- Belting, a Treatise on the Use of— for the Transmission of Power. John H. Cooper. Philadelphia. 8vo. *Claxton, Remsen & Haffelfinger*. \$3.50.
- Bridge, Report of consulting Engineers appointed to recommend a Plan for the New York & Long Island Bridge across the East River at Backwell's Island. New York. 8vo, illus.
- Canals, annual Report of State Engineer and Surveyor on the — of State of New York for year ending Sept. 30, 1876. J. D. Van Buren, Jr. Albany. 8vo.
- Cavalry, a History of —, from the earliest Times, with Lessons for the Future. Geo. T. Denison. London. 8vo, illus. *Macmillan* (New York.) \$6.50.
- Ceramic Art of Japan. Audsley and Bowes. 7 parts. London. Folio. *H. Sotheran*. 189s.
- Chemistry, elementary —; a Text-Book for Beginners. S. F. Peckham. Boston. 12mo, illus. *Morton*.
- , the Laboratory Guide; a Manual of practical Chemistry, specially arranged for agricultural Students. A. H. Church. 4th ed., rev. London. 8vo, illus. *Van Voorst*. 6s. 6d.
- Short Notes on —. Part I. Metallurgy. C. E. Shelly. 2d ed., rev. and enl. London. 8vo. (*Fan Nostrand*. New York). \$1.00.
- Coal Mines of the western Coast of the United States. W. A. Goodyear. San Francisco. 12mo. *Bancroft*. \$2.50.
- Commerce, Nineteenth annual Report of the Corporation of the Chamber of — of State of New York, for 1876-7. In 2 parts, compiled by George Wilson. New York. 8vo. *Cham. of Commerce*.
- Cremation Society of England, Transactions of —. No. 1. London. 8vo, illus. *Smith & Elder*. 1s.
- Dew Points; a short practical Treatise on —. H. P. Slade. London. 8vo, *Spons.* (New York.) 2s.
- Drawing, Treatise on linear Perspective —. J. and G. Yule. 2d ed. London. 4to. *Waterson*. 2s. 6d.
- Electrical Diagrams and Connections, Handbook of —. Charles H. Davis and Frank B. Rea. 2d ed. New York. 8vo. *Van Nostrand*. \$2.00.
- Electricity, Magnetism, and Acoustics, Handbook of —. Dionysius Lardner. Ed. by George C. Foster, London. 8vo. *Lockwood, Crosby & Co.* 5s.
- Electro-Metallurgy practically treated. A. Watt. 6th ed., with Additions. (Weale's Series.) London. 12mo, illus. *Lockwood, Crosby & Co.* 2s.
- Engineers', Transactions of the Society of —, for 1876. Ed. by P. H. Nursery. London. 8vo, illus. *Spons.* (New York.) 15s.
- Farming, Outlines of modern —, Soils, Manures and Crops; Farming and Farming Economy, historical and practical; Cattle, Sheep and Horses; Management of the Dairy, Pigs and Poultry, with Notes on the Diseases of Stock; Utilization of Town Sewage, Irrigation and Reclamation of Waste Land. R. Scott Burn. New ed. London. 8vo, illus. *Lockwood, Crosby & Co.* 12s.
- Gas Users, Common Sense for —, being a Catechism of Gas Lighting for House-Holders, Mill-Owners, and other large Consumers, Gas Fitters, Architects, Engineers, &c. Robert Wilson. London. 12mo. *Lockwood, Crosby & Co.* 2s. 6d.
- Geologist, the Pocket —, and Book of Minerals. F. H. Smith. Baltimore. 12mo. \$1.00.
- Geology for Students and general Readers. A. H. Green. 2d. ed. London. 8vo, illus. *Daldy & Isbister*. 12s. 6d.
- , River Terraces; Letters on geological and other Subjects. G. Greenwood. London. 8vo. *Longmans*. 10s. 6d.
- Geometry, Elements of —; Euclid. Book 1. E. Atkins. London. 12mo. *Collins*. 9d.
- Health. Eighth annual Report of State Board of —, of Massachusetts. January, 1877. Boston. 8vo.
- Heat, the Hand-book of —. Dionysius Lardner. Ed. and re-written by Benjamin Loewy. London. 8vo, illus. *Lockwood, Crosby & Co.* 6s.
- Hydrostatics and Pneumatics, Hand-book of —. Dionysius Lardner. Ed. by Benjamin Loewy. London. 8vo, illus. *Lockwood*. 5s.
- Iron and Steel, annual Report of Secretary of the American — Association. J. W. Swank. Philadelphia. 8vo. *Am. Iron and Steel Ass'n*.
- Kinematic Models. P. Kennedy. London. 12mo, illus. *Macmillan & Co.* (New York).

- Life, the Puzzle of — and how It has been put together. Arthur Nicols. 2d ed. London. 8vo. *Longmans*. 3s. 6d.
- Light, being Vol. I. experimental Series for Beginners. Ed. by A. M. Mayer. asst'd by Charles Barnard. New York, *Appleton & Co.* (Announcement.)
- Locomotive-Engine Driving, from the Foot-plate; a practical Manual for Engineers in charge of Locomotive Engines. Michael Reynolds. London. 12mo. illus. *Lockwood, Crosby & Co.* (Announcement.)
- Lumber Dealers, an improved Tally-book for —, with the Walnut Scale. F. Webb and M. C. Johnston. Cincinnati. 12mo. *R. Clarke & Co.* \$0.50.
- Magnetism of Iron Vessels, with a short Treatise on terrestrial Magnetism. Fairman Rogers. (Van Nostrand Science Series). New York. 18mo. illus. *Van Nostrand*. \$0.30.
- Manufacturing Industries, British: Wool, Flax, Cotton and Silk. Ed. by G. Phillips Bevan. 2d ed. 12mo. illus. *Stanford*. (Van Nostrand. New York.) \$1.75.
- Mechanics, Hand-book of —. Dionysius Lardner. Enlarged and re-written by Benjamin Loewy. London. 8vo. illus. *Lockwood, Crosby & Co.* 6s.
- Metric Manual, the Teacher's —; a complete Guide to the most effective Teaching of the Metric Weights and Measures. Boston illus. *Am. Metric Bureau*. (Announcement.) \$0.20.
- Militia, Discipline and Drill of —, a Series of Lectures. Frank S. Arnold. New York. 8vo. *Van Nostrand*. (Announcement.) \$1.50.
- Mind, Elements of Philosophy of the human —. D. Stewart. New ed. London. 8vo. *Tegg*. 7s.
- Mines, the simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Streidinger. Vienna. 8vo. (German).
- Music: a complete Text-Book of theoretical Music, with Glossary of musical Terms, Exercises on Harmony, and an Appendix. H. S. Bannister. 5th ed. 8vo. *Bell & Sons*.
- Natural History, Elements of —. A. E. Dolbear. Boston. *Ginn & Heath*. (Announcement.)
- Handbook of —. Dionysius Lardner. 5 vols. London. 8vo. *Lockwood, Crosby & Co.* 27s.
- Nautical Tables. Norries. New ed. London. 8vo. *C. Wilson*. 10s. 6d.
- Navigation, elementary —. W. H. Rosser. London. 12mo. *C. Wilson*. 2s.
- Epitome of practical —, with a complete Set of nautical Tables. Norries. New ed. London. 8vo. *C. Wilson*. 16s.
- Handy Book of —. Ad. Bethune. London. 8vo. *Blackwoods*. 5s.
- North Polar Expedition. Narrative of —. U. S. Ship *Polaris*. Ed. by C. H. Davis. Washington. 4to. illus. *Gov. Printing Office*.
- Optics, the Handbook of —. Dionysius Lardner. Ed. by T. Oliver Harding. London. 8vo. illus. *Lockwood, Crosby & Co.* 5s.
- Painting, a Treatise on —. Da Vinci, trans. from the Italian by John P. Rigaud, with a Life and an Account of his Works by John W. Brown. New ed. rev. (Bohn's Artist's Library.) London. 12mo. *Bell & Sons*. 5s.
- Patents. annual Report of the Commissioner of —, for year 1876, and Index. Washington. 8vo. *Gov. Printing Office*.
- Photography, C. Abney. London. 12mo. illus. *Macmillan*. (New York).
- Planting, a Discourse concerning western Planting, written in year 1584, by Richard Hakluyt. Now first printed from a contemporary Manuscript, with Preface and Introduction by Leonard Woods, and Notes in the Appendix, by Charles Deane. Boston. 8vo. *Williams*. \$3.00.
- Railroads and Telegraphs, Tenth annual Report of the Commissioners of — of Ohio, for year ending June 30th, 1876. Columbus. 8vo.
- Observations on — in the United States. Augustus Morris. Sydney. 8vo. illus.
- Railway Revenue and its Collection. Marshall M. Kirkman. New York. 12mo. *Railroad Gazette*. (Announcement.) \$2.50.
- Rapid Transit. Board of the Department of Public Parks. Report of the Civil and Topographical Engineer and the Landscape Architect accompanying a Plan for local Steam Transit Routes in 23d and 24th Wards. New York. 8vo. Map. (Corrected Title.)
- Railways, Indian —, their past History, present Condition and future Prospects. Julian Danvers. London. 8vo. *E. Wilson*.
- Roads and Streets, Construction of —. D. Kinneir Clark. London. *Lockwood, Crosby & Co.* (Announcement.)
- Sewage Question, the present Aspect of — as applied to Boston, a Paper read before the Am. Statistical Soc., Boston, April 30th, 1877. Charles F. Folsom. Boston. *Williams*. \$0.10.
- Water Purification of —, for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John Charles Melliss. London. 8vo. *Smith & Elder*. 5s.
- Steam Boiler Engineering, a Treatise on —, being Notes on the Strength, Construction, Erection, Fittings and economical Management of Steam Boilers. W. B. Levan. Philadelphia. 12mo. (Van Nostrand).
- Inspection, Annual Report of Hartford — Inspection and Insurance Co. 1876. Hartford. 8vo., illus.
- Engine, History of —. Robert H. Thurston. New York, illus. *Appleton & Co.* (Announcement.)
- Stones and Gems: their History and distinguishing Characteristics. Edwin W. Streeter. London. 8vo. illus. *Chapman & Hall*. 18s.
- Takimetry; concrete Geometry in 3 Lessons, accessible, inaccessible, incalculable; fundamental Takimetry. Edward Lagout. Trans. with unpub. Additions, by Daniel W. Gwynne. London. 8vo. *Culkins*. (Van Nostrand, New York.) \$1.25.
- Telegraphic Messages, Secret Code for —. W. Macgregor. London. 8vo. *Waterson*. 10s. 6d.
- Telegraph (the) Office; or, simple Instructions in the Mechanism of Instruments and Batteries, comp. by Officers of Royal Engineers. London. 12mo. *Cassell*. 1s.
- Trigonometry, spherical —. J. J. Mills Peirce. Boston. *Ginn & Heath*. (Announcement.)
- War, a critical History of the late American —. A. Mahan. with introductory Letter by M. W. Smith. New York. 8vo. *Van Nostrand*. \$3.00.
- Franco-German War, 1870-71. Part I; History of the War against the Republic. 10th Section: Investment of Paris; Capture of Toul and Strasburg, trans. from Ger-

man official Account at the Intelligence Branch of the Quartermaster General's Department, Horse Guards, by F. C. H. Clarke. London. 8vo. (British Gov. Publication). 7s. 6d.
 Water, Air and Disinfectants. W. Noel Hartley. London. 16mo. (*Van Nostrand, New York*). \$0.50.
 Whitworth measuring Machine. T. Good-

eve and P. B. Shelley. London. 4to. *Longmans* 21s.
 Winds and their Story of the World. W. L. Jordan. London. 8vo. *Hardwick & Bogue*. 3s.
 Yachtmen's Handy Book. London. 8vo. C. Wilson. 3s. 6d.
 Yachtmen, under Square Sails, for Yachtmen and Multishipmen. Thomas H. Withers. London. 8vo. C. Wilson. 2s.

ADDITIONS TO

LIBRARY AND MUSEUM.

From American Iron and Steel Association. Philadelphia:
 Annual Report of Secretary of the Association. Philadelphia. 1877. (2 copies.)

From Gen. J. G. Barnard. New York:
 Report of Board of Consulting Engineers upon Plan for N. Y. and Long Island Bridge. New York.

Also from others; (copies for distribution.)

From M. J. Becker. Columbus, O.:
 also from J. M. Woodwin. Cleveland, O.:
 Report of Joint Committee, Ohio Legislature, on the Ashtabula Bridge Disaster, Columbus. (Copies for distribution.)

From Chamber of Commerce, New York:
 Nineteenth Annual Report of the Chamber of Commerce, of New York, for 1876-7.

From R. Clarke & Co., Cincinnati, Ohio:
 Improved Tally Book for Lumber Dealers. Cincinnati. 1877.

From Claxton, Remsen & Haffelfinger, Philadelphia:
 Practical Treatise on Lightning Protection. H. W. Spang.

From Commissioners of Patents, Washington:
 Annual Report of the Commissioner for 1876. Washington.

From Cooper Union, New York:
 Eighteenth Annual Report of the Trustees. New York. 1877.

From C. D. Elliott, Somerville, Mass.:
 Annual Report, City of Somerville. 1876.

From C. D. Flowers, Columbus, Ohio:
 Tenth Annual Report of the Commissioner of Railroad- and Telegraphs of Ohio, for Year ending June 30, 1876.

From E. A. Fuertes, Ithaca, N. Y.:
 Cornell University Register and Catalogue. 1876-7. (Copies for distribution.)

From C. O. Gleim, Cologne, Germany:
 Extension and Improvement of Rhenish Railway. E. Hartwich. Berlin. 1864. With Maps and Plates.
 Map of Coal Regions at Ruhr.

From T. S. Hardee, New Orleans, La.:
 Report on a special Survey of Lake Pontchartrain. New Orleans. 1876.

From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington:
 Proposals for Iron Work of movable Dam on Great Kanawha River. (2 copies.)
 Specifications as follows: (2 copies.)

— furnishing Rubble Stone for Bulkhead at Long Point, Provincetown Harbor, Mass.

— Improvement of Illinois River. Ill.: of Penobscot River, Me.; of Pamlico River, N. C., and of Elizabeth, and of Nausemond Rivers, Va.

— Improving Harbor at Black Lake, at Charlevoix, at Frankfort, at Ludington, at Manistee, at Muskegon, and at Pentwater, Mich.; at Green Bay, Wis., and at Norfolk, Va.

From the Institution of Civil Engineers, London, Eng.:
 List of Members of the Institution, June 12th, 1877.

From C. Latimer, Cleveland, Ohio:
 Comparative Statement of Expenses in Engineering Department, Atlantic & Great Western R. R. March, April, 1876-77.

From G. Leverich, New York:
 Proceedings before Committee on Railroads of Assembly of New York, relating to Construction of Steam Elevated Railways in City of New York.

From Macmillan & Co., New York:
 Absorption of Light and the Colors of natural Bodies. Prof. Stokes. London.
 Kinematic Models. Prof. Kennedy. London.
 Outlines of Field Geology. Prof. Geikie. London.

Photography. Capt. Abney. London.
 Sound and Music. W. H. Stone. London.
 Steam Engine. F. J. Bramwell. London.
 Technical Chemistry. Prof. Roscoe. London.

From Massachusetts State Board of Health, Boston:
 Eighth annual Report of the Board. January, 1877.

From F. H. Smith, Baltimore, Md.:
 The Pocket Geologist and Book of Minerals. Baltimore. 1877.

From T. Guilford Smith, Buffalo, N. Y.:
 Proposals for Wrought and Cast Iron Work for U. S. Custom House and Post Office at Chicago. With 9 photographic Sheets of Drawings.

From John D. Van Buren, Jr., Albany:
 Annual Report of State Engineer and Surveyor on the Canals of the State. Albany, 1877.

From J. H. Streidinger, New York:
 The simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Streidinger. (German.) Vienna.

From Van Antwerp, Bragg & Co., Cincinnati, Ohio:
 Elements of agricultural Geology, for Schools of Kansas. W. D. Kedzie. Cincinnati. 1877.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for the next three months will be held as follows: a *regular* meeting, when ballots for members will be canvassed and other business done, Wednesday, September 5th; and a *stated* meeting, for consideration of professional topics and enjoyment of social intercourse, Wednesday, September 19th—each at 8 o'clock p. m.

MEETINGS OF THE BOARD OF DIRECTION during the same term, for the transaction of regular business, will be held Wednesday, August 1st, and September 6th, at 3 o'clock p. m.

No regular or stated meetings of the Society will be held from July 12th to September 5th.

LIST OF PAMPHLETS FOR DISTRIBUTION among members of the Society, on hand July 1st, 1877, is herewith presented. Stamps to prepay postage should be sent by those who apply for copies. It will be sufficient to mention the number of title.

Address of A. L. Holley before American Institute of Mining Engineers, at Cleveland.—(1.)

— of A. L. Holley before American Institute of Mining Engineers, at Washington.—(2.)
— of W. J. McAlpine, at Albany, on Public Works of the State.—(3.)

Ashabula Bridge Disaster. Report of Joint Committee of Ohio Legislature.—(4.)

Catalogue of Scientific Books. *Van Nostrand*.—(5.)

— of Scientific Books. *Wiley*.—(6.)

Cornell University Register and Catalogue.—(7.)

Engineering in Sweden. C. P. Sandberg.—(8.)

Exhibit of Stevens Institute of Technology at Centennial Exhibition.—(9.)

Fisher Rail Joint.—(10.)

Foundation of Washington National Monument. Report of Committee.—(11.)

Geographical Survey in the United States.

G. K. Warren.—(12.)

Mississippi River. Improvements of South Pass. Fifth Report. C. B. Comstock.—(13.)

— Improvement of South Pass. Sixth Report. C. B. Comstock.—(14.)

— Report on Jetties on South Pass.

J. B. Eads.—(15.)

Rail Sections. Traffic Capacity of Sandberg's Standard —.—(16.)

Sewerage. Report on — for City of Providence.—(17.)

Sewers. Tenth Quarterly Report of Water Commissioners of City of Providence on.—(18.)

Steel Cable Wire for East River Bridge. Specifications.—(19.)

— Price List and Circulars of Chrome Steel Co.—(20.)

Transportation Route along Wisconsin and Fox Rivers. Report by G. K. Warren.—(21.)

Water Department. City of Philadelphia. Annual Report of Chief Engineer for 1875.—(22.)

— Report on the Purification of — upper Harbor of Baltimore. W. J. McAlpine.—(23.)

— Supplies for City of San Francisco. Engineer's Report.—(24.)

— Ways of Europe. Reports by J. G. Barnard, J. W. Adams and S. Stevens.—(25.)

— Works City of Montreal. Report by W. J. McAlpine.—(26.)

— City of Philadelphia. Notes referring to —, from 1801-1815.—(27.)

— for supply of City of Norfolk. Report and Plan, by W. J. McAlpine.—(28.)

INSTITUTION OF CIVIL ENGINEERS, LONDON.
—Referring to "List of Members" of the Institution, issued June 12th, 1877, the following are noted—in addition to names heretofore published (Vol. II, page 171)—as being also members of this Society:

Holley, Alexander Lyman. [M.] New York.
Roberts, William Milnor. [M.] New York.

PAPERS FOR THE NORMAN MEDAL should be presented before September 5th next. The conditions of award are set forth in the Code of Rules heretofore published in the Journal; a copy will be furnished to applicants.

No award having been made last year, it is announced that, under Rule VI, two premiums are offered for the coming year, one being a gold medal for the best paper, and the other, books (costing \$70 currency), for the second best paper, competing.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn in broad, sharp lines, upon white, smooth (not "egg" or enamelled) paper, with perfectly (not glossy, or grey) black ink, to a scale twice or thrice greater than the print is to be; which in no case should require folding in more than one direction (*i. e.*, the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be well put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a lineal scale upon each drawing.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from 9 o'clock, A. M. to 5 o'clock, P. M. each business day, except Saturday, when they are closed at 3 o'clock, P. M. Members desiring admission outside these hours, should apply to the Secretary.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. August, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JULY 12TH, 1877.—An adjourned regular meeting was held at eight o'clock P. M.

The vote on admission to membership was canvassed, and the following declared elected: Members—John W. Bacon of Danbury, Conn.; Charles E. L. B. Davis of Galveston, Texas; William B. Hyde of Oakland, Cal.; Benjamin F. Morse of Cleveland, Ohio, and Arthur F. Wrotnowski of New Orleans, La.; and Junior, Arthur Macy of New York.

OF THE BOARD OF DIRECTION.

JULY 18TH, 1877.—A special meeting was held at three o'clock P. M. for transaction of regular business. A quorum not being present, no action was taken.

AUGUST 1ST, 1877.—A stated meeting was held at three o'clock P. M., and proposals for admission to membership were considered.

AUGUST 7TH, 1877.—An adjourned meeting was held at ten o'clock A. M.

The Committee appointed* to prepare a form of letter ballot on the resolutions, referred to the Board at the Ninth Annual Convention† and to present statements of reasons for and against the action thereon proposed, made report, which was considered, and referred to the Committee for amendment.

Applications for admission to the Society were taken up, appropriations made, and other business done.

* The Committee consists of Theodore G. Ellis, J. James R. Croes, and Matthias N. Forney.

† Pages 47, 48, 51 and 52.

LIST OF NEW BOOKS ON
ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

- Architecture, Some Account of domestic Architecture in England, from the Conquest to End of Thirteenth Century. T. H. Turner. 2nd ed. London. 8vo. Parker. 21s.
- Artillery, Manual for the 64-Pounder rifled M. L. converted Guns of 58 and 71 cwt., L. S. (British Government Publication). London. 8vo. 6d.
- Birds, Outdoor common —, their Habits and general Characteristics, with original illus. of the Birds and their Eggs. Henry Stannard. London. 12mo, illus. Warne. 1s. 6d.
- Builder's Clerk, a Guide to the Management of a Builder's Business. Thomas Bales. London. 12mo. Spens. (New York). \$0.60.
- Butter and Butter-Making, with the best Methods for Producing and Marketing It. Willis P. Hazard. Philadelphia. 12mo. Porter & Coates. \$0.25.
- Bridges, Cable Making for Suspension —, as exemplified in the Construction of the East River Bridge. Wilhelm Hildenbrand. (Van Nostrand's Science Series.) New York. 18mo, illus. (Announcement). \$0.50.
- Carriers of Goods and Passengers by Land and by Water, a Treatise on the Law of —. Joseph K. Angell. 5th ed., rev., cor., and enl., by John Lathrop. Boston. 8vo. Little, Brown & Co. \$6.00.
- Chemical Composition of Foods, Water, Soils, Minerals, Manures and miscellaneous Substances. E. T. Kensington. London. 12mo. Churchill. 5s.
- Chemistry, an elementary Treatise on practical Chemistry and qualitative inorganic Analysis. Frank Clowes. From 2nd English ed. Philadelphia. 12mo, illus. Lea. \$2.50.
- Civil Engineering, an elementary Course of — —, for Cadets of United States Military Academy. J. B. Wheeler. New York. 8vo, illus. Wiley & Sons. \$4.00.
- Climate and Diseases of North America, being an Appendix to the "Influence of Climate in North and South America," giving Health Statistics of States, Cities, etc., compiled by J. Disturnell. New York. (Announcement). Wiley & Sons. \$2.00.
- Coal, a deep Boring for — at Searle, Lincolnshire, and its Bearing on the Question of easterly Limit of Yorkshire Coal Measures, beneath the newer Formations. Edward Hall. With Abstract of Discussion. (Minutes of Proceedings, Institute of Civil Engineers). London. 8vo, illus. Inst. Civil Engineers.
- Gas, a practical Treatise on the Manufacture and Distribution of —. William Richards. London. 4to, illus. Spens. (New York). \$12.00.
- Colonist, the textile —: a monthly Journal of Bleaching, Printing, Dyeing, &c., ed. by Charles O'Neill. Vol. III. Manchester. 8vo, illus. (London. Simpkin). 21s.
- Commerce, First annual Report of the Chief of Bureau of Statistics, on the Internal — and Navigation of the U. S., for Year ending June 30th, 1876. 2 vols. Washington. 8vo. Gov. Printing Office.
- Cotton Manufacturer's Assistant. E. D. Foley. 2d ed. Manchester. 12mo. (London. Simpkin). 2s.
- Drawing, industrial Courses in — on Machinery, Civil Engineering, ceramic Art and interior Decorations. New York. (Announcement). Appleton & Co.
- Dynamics, an elementary Treatise on —, of System of rigid Bodies, with numerous Examples. 3rd ed., rev. and enl. London. 8vo, illus. Longmans. (New York, Van Nostrand.) \$7.50.
- Engineering Magazine, Van Nostrand's Eclectic — —, Vol. XVI. January to June, 1877. New York. 8vo, illus. Van Nostrand. \$3.00.
- Encyclopædia Britannica, a Dictionary of Arts, Sciences and general Literature. 9th ed. Vol. VI. Ch.-Day. Edinburgh & Boston. 4to, illus. Little, Brown & Co. \$9.50.
- Engineers, Journal of the Hungarian Society of — and Architects. Buda Pest. 8vo, illus. (Hungarian).
- Society of —, Transactions for 1876. Ed. by Perry F. Nursey. London. 8vo, illus. Spens. (New York).
- Explosives Act, 1875, the Orders in Council and of the Secretary of State under that Act, a Guide for the Use of local Authorities and their Officers. V. D. Majendie. (British Gov. Publication.) London. 2s.
- Ferns of North America, Illustrations of —, Text by Daniel C. Eaton, illus. by James H. Emerton. Part I. Salem. 4to, illus. Naturalists' Agency. \$1.00.
- Fisheries, Sea —. E. W. H. Holdsworth. Salmon Fisheries. Archibald Young. London. 12mo. Stanford. 4s. 6d.
- Fossils, the American palæozoic —, a Catalogue of the Genera and Species, with Names of Authors, Dates, Places of Publication, &c. S. A. Miller. Cincinnati. 8vo, illus. (Van Nostrand, New York). \$3.00.
- Founding of Metals, a practical Treatise on Melting of Iron. Edward Kirk. Albany. 12mo, illus. Kirk. \$2.00.
- Geometry, descriptive —. Shadows and Perspective. S. Edward Warren. New ed., cond. and comp. New York. 8vo, illus. Wiley & Sons. (Announcement). \$3.50.
- Geometry, natural —, an Introduction to the logical Study of Mathematics, for Use of Schools and technical Classes; with explanatory Models based upon the tachymetrical Works of Edouard Lagout. A. Maill. London. 18mo. Macmillan, (New York). 2s. 6d.
- Graphical Statics, new Construction in —. Henry T. Eddy. New York. 8vo, illus. Van Nostrand. \$1.50.
- Gun Cotton and its Manufacture, Short Notes on —, prepared for the use of Cadets at Royal Military Academy. Woolwich; also on Gunpowder and its Manufacture. H. Geary and W. H. Waddell. (British Gov. Publication.) London. 12mo. 1s.

- Industrial Science, Outlines of —. D. Syme. 2nd ed. London. 8vo. *Henry S. King*. 6s.
- Marine Survey, East India, Report on —. (Parliamentary.) London. 8vo. 11d.
- Materialism, a History of —. F. A. Lange. Auth. Trans. from the German, by Ernest C. Thomas. 3 vols. Vol. I. (English and Foreign Philosophical Library, Vol. I.) Boston. 8vo. *Osgood*. \$3.50.
- Mechanical Engineers, Proceedings of Institution of —. May, 1877. London. 8vo, illus.
- Mechanics, Elements of analytical —, with Examples. De Volson Wood. 2nd. ed., rev. and enl. New York. 8vo. illus. *Wiley & Sons*. \$3.00.
- Merchant and Revenue Marine, and Naval Vessels of the U. S., for Year ended June 30, 1875, and to June 1, 1876. 8th annual Report. Washington. 8vo. *Gov. Printing Office*.
- Military Artificers' Handbook, prepared in Instruction Branch of the Royal Carriage Department. April, 1877. London. 32mo, (British Gov. Publication.) 3s.
- Militia, Discipline and Drill of —. Frank S. Arnold. New York. *Van Nostrand*. \$2.00.
- Minerals of New England, where and how to find Them. F. T. Bartlett. (Announcement.)
- Mines. Inspector's Reports for 1876. (British Gov. Publication.) London. 6s. 6d.
- Navigation and nautical Astronomy, a Treatise on —, supplying Tables in which each Number can be instantly tested or easily and independently calculated. Oliver Byrne. London. 4to. *Bentley*. 42s.
- Ordnance. Treatise on Construction and Manufacture of — in the British Service. Prepared in the Royal Gun Factory. (British Gov. Publication.) London. 8vo. 18s.
- Paper and Paper Making. Chronology of the Origin and Progress of —. Joel Munsell, 5th ed., with add. Albany. 12mo. *Munsell*. \$2.00.
- Power, the Transmission of — a long Distance. Henry Robinson, with Abstract of Discussion. (Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Engs.*
- Perfumes, a Treatise on the Manufacture of —, and kindred Toilet Articles. John H. Snively. Nashville. 8vo. *C. W. Smith (Van Nostrand, New York)*. \$3.00.
- Plumber, the — and sanitary Houses, a Practical Treatise on the Principles of internal Plumbing Work, or the best Means for effectually excluding noxious Gases from Houses. S. S. Hellyer. London. 8vo. *Batsford*. 7s. 6d.
- Produce Exchange, New York. Annual Report of Board of Managers of — — for Year ending June 1st, 1876. S. H. Grant. New York. 8vo. *Produce Exchange*.
- Railroads of the United States, Manual of —, for 1877-8, showing the Mileage, Stocks, Bonds, Cost, Traffic, Earnings, Expenses, Organizations, etc., with Analysis of Debts of the United States and of the several States. Henry V. Poor. 10th series. New York. 8vo. *H. F. & H. W. Poor*. \$5.00.
- Railway Accidents. Inspector's Reports, 1876. Part 9. Returns and Reports, January to March, 1877. (Parliamentary Reports.) London. 8vo, illus. 2 Numbers. 4s. and 9s.
- Rights, Realities and Personalities, a general Classification of —; designed to facilitate the Work of Taking an accurate Inventory of such Property. George T. Balch. New York. Folio.
- Railways. Continuous Brakes. Correspondence. (Parliamentary Reports.) London, 8vo. 4d.
- Use of mechanical Power on Tramways. Parliamentary Report of select Committee, with Evidence. London. 8vo. 2s. 9d.
- Rainfall, British —, The Distribution of Rain over the British Islands, during 1876. C. J. Symons. London. *Stanford*. 5s.
- Rocks, a Guide to the Determination of —, being an Introduction to Lithology. E. Jauncey. Trans. from the French by G. W. Plympton. New York. 12mo, illus. *Van Nostrand*. (Announcement.)
- Sailors' Pocket Book. F. G. D. Bedford. 3d ed., rev. and enl. Portsmouth. 16mo. *Simpkin, (London)* 7s. 6d.
- Sanitary Condition of Dwelling Houses in Town and Country. George E. Waring, Jr. New York. 18mo, illus. (Van Nostrand's Science Series.) (Announcement.) \$0.50.
- Sewerage. Report of joint special Committee on improved —. Boston. 8vo.
- on the —, of City of Quincy. McRitchie & Nichol. Milwaukee. 8vo.
- Ships of War (European) —, and their Armament, Naval Administration, Economy, Marine Constructions, Appliances and Dock Yards. J. W. King. U. S. N. 8vo, illus. Washington. *Gov. Printing Office*.
- Sound, the Theory of —. John Wm. Strutt. Vol. I. London. 8vo. *Macmillan, (New York)*. \$4.50.
- Stenography, a brief History of the Art of —, with a proposed new System of phonetic Shorthand. William P. Upham. Somerville. 8vo. *Essex Institute*. \$1.25.
- Strains, the Theory of transverse Strains and its Application to the Construction of Buildings, including a full Discussion of the Theory and Construction of Floor Beams, Girders, Headers, Carriage Beams, Bridging, rolled Iron Beams, tubular Iron Girders, Cast-iron Girders, framed Girders, and roofed Trusses; with Tables, calculated expressly, of the Dimensions of Floor Beams, Headers, and rolled Iron Beams; also showing Results of original Experiments on tensile, transverse and compressive Strength of American Woods. R. G. Hatfield. New York. 8vo. *Wiley & Sons*. \$6.00.
- Village Improvements and Farm Villages. George E. Waring, Jr. Boston. 18mo, illus. *Osgood*. \$0.75.
- Water Board. First Annual Report of the Board of —, for Year ending April 30th, 1877. Boston. 8vo.
- Supply Engineering, a practical Treatise on — — —, relating to the Hydrology, Hydrodynamics, and practical Construction of Water Works in North America, with numerous Tables. John T. Fanning. New York. 8vo, illus. *Van Nostrand*. \$6.00.
- of small Towns and Villages. Hints on. L. L. Macassey. London. 8vo. *Spon's, (New York)*. \$1.50.
- Weighing and Measuring, the Science of — —, and Standards of Measure and Weight. H. W. Chisholm. London. 12mo, illus. *Macmillan, (New York)*. 4s. 6d.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From American Institute of Architects, New York:
Constitution and By-Laws, of the Institution, September, 1876.
- From A. Ambrozovics, Buda Pest, Hungary;
Photographs of Bridges and Buildings in Hungary. 6 pictures.
- From Association of Civil Engineers and Architects of Mexico, Mexico:
Address delivered for the Association, on election to its Presidency, by F. de Geray. Mexico. 1877.
- From George T. Balch, New York:
A general Classification of Railway Rights, Realities and Personalities. George T. Balch. New York. 1877.
- From William S. Barbour, Cambridgeport, Mass.:
Eighth annual Report of State Board of Health of Massachusetts, January, 1877. Boston.
- From Boston Public Library, Boston, Mass.:
Bulletin No. 42, July, 1877.
Twenty-fifth annual Report, Boston Public Library. 1877.
- From Henry C. Carey, Philadelphia:
Resumption, when and how will it end?
Letters to President of the U. S. H. C. Carey. Philadelphia.
- From J. James R. Croes, Yonkers, N. Y.:
Department of Public Parks. Report of Civil and Topographical Engineer and the Landscape Architect, accompanying a Plan for local Steam Transit Routes in 23d and 24th Wards, New York. (Additional copies for distribution.)
- From Joseph P. Davis, Boston, Mass.:
First annual Report of the Boston Water Board for Year ending April 30th, 1877. (2 copies.)
Report of joint special Committee on improved Sewerage. Boston. 1877. (2 copies)
- From Gen. Quincy A. Gillmore, New York:
Foundation of the Washington National Monument. (Additional copies for distribution.)
- From S. H. Grant, Supt. Produce Exchange, New York:
Annual Report of New York Produce Exchange for Year ending June 1st, 1876. New York. 1877.
- From R. G. Hatfield, New York:
Theory of transverse Strains and its Application in the Construction of Buildings. R. G. Hatfield. New York. 1877.
- From R. Hoe & Co., New York:
Descriptive Catalogue of Printing Presses. R. Hoe & Co. New York.
- From Gen. A. A. Humphreys, Chief of Engineers, U.S.A., Washington, D.C.:
Fifth and Sixth Reports upon the Improvement of the South Pass of the Mississippi River. Separate numbers. (Additional copies for distribution.)
- From Hungarian Society of Engineers and Architects, Buda Pest, Hungary:
Journal of the Society—from January, 1877.
- From Institution of Civil Engineers, London:
Deep Boring for Coal at Searle, Lincolnshire. Edward Hall, with Abstract of Discussion, (Excerpts from Minutes of Proceedings.) London. 1877.
- Transmission of Power, a long Distance. Henry Robinson, with Abstract of Discussion, (Excerpts from Minutes of Proceedings.) London. 1877.
- From Institution of Mechanical Engineers, London:
Proceedings of the Institution, May, 1877. London.
- From Long Island Railroad Co., Brooklyn, N. Y.:
Long Island, and where to go. New York, 1877.
- From MacRitchie and Nichol, Milwaukee, Wis.:
Report on the Sewerage of City of Quincy, Ill. Milwaukee. 1877.
- From R. J. Morrison, New York:
The City Record. 6 parts. New York. 1876.
- From Joseph Nimmo, Jr., Washington:
First Annual Report on internal Commerce of the United States. Washington. 1877.
- From H. V. and H. W. Poor, New York:
Manual of the Railroads of the United States for 1877-78. New York. 1877.
- From W. S. Schock, Engineer-in-chief, U. S. Navy, Washington:
Report of Chief Engineer J. W. King, U. S. Navy, on European Ships of War, their Armaments, &c. Washington. 1877.
- From John Sherman, Secretary of Treasury, Washington:
Annual Report of Chief of Bureau of Statistics on Commerce and Navigation of the U. S. for Year ending June 30, 1876. Washington.
- From T. Guilford Smith, Buffalo, N. Y.:
Proposals for wrought and cast Iron Work for United States Custom House and Post Office at Cincinnati, also at Chicago, with 11 Sheets of photographed Drawings. Washington.
- From Society of Engineers, London:
Transactions for 1876. Ed. by P. F. Nursey, Secretary. London. 1877.
- From Frank H. Taylor, Philadelphia:
American Society of Civil Engineers, 1877. Illustrated Record of the southern Excursion. F. H. Taylor. Philadelphia. 1877.
- From D. Van Nostrand, New York:
Magnetism of Iron Vessels, with a short Treatise on terrestrial Magnetism. Fairman Rogers. New York. 1877.
- Strength and Calculations of Dimensions of Iron and Steel Constructions, with Reference to latest Experiments, trans. from German of J. J. Weyrauch. New York. 1877.

From H. F. Walling, Boston, Mass. :
Appalachia. June, 1877. Boston. (2 copies.)

From B. Westerman & Co., New York :
Catalogue of German, English, American and
French Periodicals. Parts I, II. New York.

From miscellaneous Sources :
Encyclopædia Britannica, a Dictionary of
Arts, Sciences and general Literature.
Ninth Ed., Vol. VI., Cli-Day. Boston.
1877.

Industrial Art Education. (An Address by
Walter Smith, in Philadelphia, April 23d,
1875.)

Report of Joint Committee concerning the
Ashtabula Bridge Disaster, Ohio Legisla-
ture. Columbus. 1877. (Additional cop-
ies for distribution.)

Silver as a Commodity, as Money and as a
material for Tokens, Coins, or fractional
Currency. W. D. Kelley. Philadelphia.
1877.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY for remainder of
the Society year, will be held as follows: *regu-
lar* meetings, when ballots for members and
upon resolutions submitted to vote, will be
canvassed, and other business done, Wednes-
day, September 5th and October 3d; and *stated*
meetings, for consideration of professional
topics and enjoyment of social intercourse,
Wednesday, September 19th and October 17th,
each at eight o'clock p. m.

MEETINGS OF THE BOARD OF DIRECTION
during the same term, for the transaction of
regular business, will be held Wednesday,
September 5th, and October 3d, at three
o'clock p. m.

No regular or stated meetings of the So-
ciety, will be held from July 12th to Sep-
tember 5th.

PAPERS HAVE BEEN PRESENTED, not previ-
ously announced, as follows :

Failure of the Ashtabula Bridge, a Discussion.

W. Milnor Roberts.....April 5th, 1877.
Eye-Bar Heads, a Discussion.

C. Shaler Smith.....June 2d, 1877.

Consideration of the Impact of a falling Body.

Charles H. Haswell.....June 10th, 1877.

On a new Type of Steam-Engine, theoretically
capable of Utilizing the full mechanical
Equivalents of Heat Energy, and on some
Points in Theory, indicating its Practi-
cability.

Robert H. Thurston.....July 13th, 1877.
Report at the Ninth Annual Convention of E.
L. Corthell, on the Mississippi River, a Dis-
cussion.

William H. Searles.....July 27th, 1877.

PAPERS FOR THE NORMAN MEDAL should be
presented before September 5th next. The
conditions of award are set forth in the Code
of Rules heretofore published in the Journal;
a copy will be furnished to applicants.

No award having been made last year, it is
announced that, under Rule VI. two pre-
miums are offered for the coming year, one

being a gold medal for the best paper, and
the other, books (costing \$70 currency), for
the second best paper, competing.

PAPERS ON ENGINEERING SUBJECTS, giving
results of practice, or in discussion of per-
tinent theoretical questions, are desired from
members of the Society; their comments
(whether or not present at meetings of the
Society), upon papers published in Transac-
tions, are solicited, and they are urged to con-
tribute from note-books and other similar
records, whatever may bear upon the sub-
jects considered, or refer to other practical
topics. A list of subjects relating to the prac-
tice of engineering and its connection with
kindred art and public affairs, on which
papers are desired, may be found on page 51,
Vol. I.

ILLUSTRATIONS of PAPERS presented for
publication should be distinctly drawn in
broad, sharp lines, upon *white, smooth* (not
"egg" or enameled) paper, with perfectly
(not glossy, or grey) *black* ink, to a scale twice
or thrice greater than the print is to be;
which in no case should require folding in
more than one direction (*i. e.*, the depth of
plate, as inserted in Transactions, should not
exceed 7 inches). Shades are to be produced
by variations in size and spacing of *black*
lines; no brush work or colors are admis-
sible. Unless figures and letters can be *well*
put in, simply pencil them, leaving the en-
graver to insert them on the plate. Always
put a lineal scale upon each drawing.

THE ROOMS OF THE SOCIETY are at 104
East Twentieth street, one door east from
Fourth avenue, and near southwest corner of
Gramercy Park. They are open from 9
o'clock, A. M. to 5 o'clock, P. M. each business
day, except Saturday, when they are closed
at 3 o'clock, P. M. Members desiring admis-
sion outside these hours, should apply to the
Secretary.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election
BACON, JOHN W.....Danbury, Conn.....	July 12, 1877.
BENSON, FREDERICK S.....Engineer Nassau Gas Light Co., Brooklyn, N. Y.	Feb'y 7, 1877.
DAVIS, CHARLES E. L. B....Lieut. of Engineers, U. S. A., Galves- ton, Texas.....	July 12, "
MACY, ARTHUR, [J.].....159 Henry st., New York.....	" "
MORSE, BENJAMIN F.....City Civil Engineer, Cleveland, Ohio.	" "

CHANGES AND CORRECTIONS.

BAXTER, GEORGE S.....	(Care Am. Soc. Civil Engs.), 104 East Twentieth st., New York.
BLAND, JOHN C.....	530 Walnut st., Philadelphia, Pa.
BROOKS, THOMAS B.....	Box 298, Newburgh, N. Y.
COOPER, THEODORE.....	(Care Delaware Bridge Co.), 52 Wall st., New York.
DUBARRY, EDMUND L.....	Supt. C. D. & V. R. R., Chicago, Ill.
DUBOIS, AUGUSTUS JAY....	Prof. Dynamical Engineering, Sheffield Scientific School, Yale College, New Haven, Conn.
DURHAM, C. WHEELER.....	166 Pine st., Chicago, Ill.
FINK, ALBERT.....	346 Broadway, New York.
FLINT, EDWARD A.....	(Care B. Kimball), 14 Sears Building, Boston, Mass.
GUNN, WILLIAM A.....	Lexington, Ky.
HILTON, CHARLES.....	105 Lancaster st., Albany, N.Y.
HJORTZBERG, MAX.....	387 North La Salle st., Chicago, Ill.
HORTON, SANDFORD.....	Div. Eng. C., C. & B. H. R. R., Covington, Dakota Co., Neb.
JORDON, GABRIEL.....	Vice-Pres. and Gen. Mang. H. & T. Cen. R. R., Houston, Texas.
KENNEDY, JOHN C.....	Florence, N. J.
NICHOLS, OTHNIEL F.....	141st st., near Willis Av. (Morrisania), New York.
PICKETT, WILLIAM D.....	Helena, Mon.
RICE, EDWARD C.....	3631 Baker Av., St. Louis, Mo.
SEARS, ALFRED L.....	Chimbotu, Peru.
SMITH, ISAAC W.....	(Care Williams & Thornton), San Francisco, Cal.
STUCKLE, HENRY W. DE....	(Care William E. Worthen), 63 Bleecker st., New York.
TASKER, CHARLES A.....	Res. Eng., C. S. R. R., North Tower, Jessamine Co., Ky.
VINTON, FRANCIS L.....	Denver, Col.

DECEASED.

COOKE, ROBERT L.....	New York.....	Aug. 11, 1877.
EMACK, CHARLES E.....	Culpepper, Va.....	July 27, "
OGDEN, WILLIAM B. [F.]..	New York.....	Aug. 3, "

American Society of Civil Engineers.

PROCEEDINGS.*

Vol. III. September, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 5TH, 1877.—A regular meeting was held at eight o'clock P. M.

The vote upon admission to membership was canvassed, and the following declared elected: Members—John B. Atkinson of Earlington, Ky.; Charles B. Brush† and Arthur Spielmann‡ of Hoboken, N. J.; George M. Frazell and James A. Hayward of Galveston, Texas; Philip Golay of Cincinnati, O.; Thomas H. Johnson of Columbus, O.; H. W. Parkhurst of Louisiana, Mo.; and Clinton F. Stephens of Dallas, Texas; Associate—Alfred G. Compton of New York; and Junior—William D. Bullock of Providence, R. I.

The deaths of members were announced, as follows: Louis Nickerson, late of Baltimore, a Member from October 29th, 1872, died May 6th; Charles S. Emack, late of Culpepper, Va., a Member from January 24th, 1872, died July 26th; William B. Ogden, late of New York, a Fellow since March 24th, 1878, died August 2d; Robert L. Cooke, late of New York, a Member since October 23d, 1872, died August 11th, and Henry Tyson, late of Baltimore, a Member since July 13th, 1872, died September 2d; and it was moved that a committee be appointed for each, to prepare a memoir of the life and professional services of the deceased.

Letters were read from the Austrian Commission for the International Exhibition at Philadelphia, the Minister of Public Works of Prussia, and the Swedish Society of Engineers, thanking this Society and its members

* Up to October 9th, 1877. † Became Associate, September 28th, 1871. ‡ Became Associate, August 29th, 1873.

for courtesies shown foreign engineers who visited this country during the Exhibition; from Charles E. Billen, describing a drawing-board for use in the field; from Robert Briggs, in regard to apparent discrepancies in "Report on Means of averting Bridge Accidents," presented by James B. Eads, and C. Shaler Smith,* and from J. Foster Flagg, describing a peculiar roof truss.

The following amendment to the Constitution, recommended by the Board of Direction for adoption by the Society, was offered and action thereon deferred to a subsequent meeting:

ARTICLE —. Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

These papers were presented: "Design for a Steam Vacuum Pump," by William H. Lotz, M. E. of Chicago, Ill.; "Cushioning the reciprocating Parts of Steam Engines," by John W. Hill, M.E. of Hamilton, O., and on "Levees, a Discussion," by J. Foster Flagg, C. E. of Meadville, Pa.

The Chairman of the Committee on Library raised the question, that as the Committee had decided Mr. Lotz's paper to be of a class which should not be published by the Society (it being the description of a structure which had not been built), whether it was proper to be read at a meeting of the Society. The question was discussed, and on motion, the paper was laid on the table.

The Society adjourned to meet September 19th, 1877, for the transaction of regular business.

SEPTEMBER 19TH, 1877.—A stated and adjourned regular meeting was held at eight o'clock P. M.

The amendment to the Constitution offered at the meeting, September 5th, was taken up and formally submitted to the Society for adoption.

A communication from Clemens Herschel,† to voting members of the Society, as to the ballot upon the resolutions referring to the adoption of the metric standards, before the Society, was read.

Charles E. Emery, C. E., of New York, gave a continuation of his Paper‡ on "Relative Quantities of Material in Bridges of different Kinds, of various Heights."

OCTOBER 3D, 1877.—A regular meeting was held at eight o'clock P. M.

The vote closing this day, upon the following resolutions, as submitted to letter ballot, was canvassed.

I.—Resolved, that a committee of five, whose names shall be selected by letter ballot, shall be appointed to draft a law covering the points outlined on pages 125, 126, 127, 128, Transactions, May, 1875, adding thereto the necessary provisions to secure the inspection by experts of all questionable bridges now in existence.

* Transactions, Vol. IV, page 122, &c. † Page 91. ‡ Transactions, Vol. VI, page 235.

And further, that this law, so drafted, shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to the Society for letter ballot, and, if approved, that printed copies of the said law and the accompanying resolution be sent to the members of the Society, with a request that they move actively, each in his own State, towards procuring the passage of the specified law by the various State Legislatures during the coming winter.*

ARGUMENT FOR.—1. The prevention of bridge accidents is more desirable than arrangements for sitting in judgment on them after they occur.

2. As the National Legislature has for some time been passing laws for the protection of life on the navigable waters of the United States, so, sooner or later, will the question of the proper construction of railways be taken up and legislated upon.

3. Many mistakes are made in laws, owing to ignorance on the part of those passing them, and the undue influence of interested inventors and manufacturers.

4. As laws regulating the construction of bridges and railroads will certainly be passed, and official positions will assuredly be created by them, it is far better that this Society should take time by the forelock, dictate a law which shall be just and equitable, and hold control of the appointments under it, than that it should stand in the back-ground until an aroused public opinion compels legislation which may be injurious to the profession, especially if enforced by political appointees who may be utterly unfit to hold such positions. All laws are written by some one, and the greater the knowledge of the subject matter on the part of the person is, the more probable is the production of a good and wise statute.

5. The fixing of the standard as proposed, the preparation of such a law as suggested, and the professional surveillance of the appointees under it, are eminently the province of this association; and all legislation on the subject should be both inspired and dictated by this Society, which is the most competent authority in the premises.

ARGUMENT AGAINST.—The resolution is objectionable:

1. As to mode of appointment of the committee to draft a law. A committee of five

cannot well be appointed by letter ballot. No provision is made for any mode of nomination of the members, and unless some interested parties electioneer for certain nominees, the probability is great that there will be a very scattering vote, and no one be chosen except after several ballots, a mode of procedure both dilatory and expensive. The principle, too, is contrary to the established rule in deliberative bodies, that such committees should be named by the presiding officer, who is assumed to be impartial and to know who are experts in certain branches better than do the mass of voting members.

2. As regards the *policy of the Society*. The Society, as a body, is not competent to set forth opinions on any special points of practice. It is not an association of bridge experts alone, nor is a majority of its members qualified to sit in judgment on the questions involved in bridge construction. The tendency of the proposed action would be to place the Society in a false position before the public, by making it appear that the views of a few persons were supported by a large body of scientific men, whereas, in fact, a large majority of that body is engaged in occupations altogether different from the one under consideration, and the votes of that majority will really not be based on any conviction. One prominent point in the scheme proposed, is the appointment by the Society of the experts to examine bridges. A full discussion has been had on this question, which resulted in the adoption by the Annual Convention of 1875 of a resolution declaring that it was inexpedient. The action now proposed is an effort to revive an issue which was supposed to be disposed of satisfactorily to the majority of the members.

3. The members of this Society are not supposed to be experts upon questions of law.

Upon this resolution there were 32 votes yes, 86 votes no, and 1 blank.

II.—Resolved, that a committee of five whose names shall be selected by letter ballot, shall be appointed to draft a law requiring tests of

* Proposed by C. Shaler Smith, page 45. † See Vol. 1, page 260, &c.

finished bridges before, and at stated times after, their opening for public travel.

And further, that this law so drafted shall be submitted, together with a resolution recommending its adoption by the various State Legislatures, to this Society for letter ballot, and if approved, that printed copies of the said law and the accompanying resolution to be sent to the members of the Society, with a request that they move actively, each in his own State, toward procuring the passage of the specified law by the various State Legislatures during their next session.*

ARGUMENT FOR.—If it be considered undesirable to put legal restrictions upon the construction of bridges, then it may be advisable to provide for the testing of such bridges as may be built.

ARGUMENT AGAINST.—The subject matter of this resolution appears to be embodied in the previous one of C. Shaler Smith, and the two subjects, it appears, should be considered together.

Upon this resolution, there were 24 votes yes, 90 votes no, and 5 blank.

III.—Resolved, that the form of memorial submitted† be adopted by the Society, be signed by the President and Secretary, and transmitted to the two Houses of Congress.‡

ARGUMENT FOR.—Inasmuch as the proposed reform has been chiefly advocated by bodies of physicians, druggists, teachers, apothecaries and chemists, together with a few architects, engineers and men of science, principally professors in our institutions of learning, it would add great weight to the proposed enforcement of the metric system if some respectable body of practical men like the American Society of Civil Engineers, would advocate its general adoption.

Although the proposition in the "memorial" differs from what the Committee were instructed by the Society to prepare, yet the change became necessary, as there exists no "Office of Weights and Measures at Washington" in which the metric standard could be adopted, and it would not do for the advocates of a new system of weights and measures to appear to be ignorant upon so vital a point.

The Committee, therefore, being unable to prepare a memorial in furtherance of the adoption of the metric standards in an office

which has no existence, has made the best substitute which their view of the subject suggested.

ARGUMENT AGAINST.—The memorial is objectionable, because:

1. The first clause states a simple fact, but the statement is so made as to create a false impression. While it is true the opinion is widely received that the metric system will eventually supersede the present, it is also true that the contrary opinion is more widely received.

2. The last clause is altogether different from what the Committee was directed by the Society to ask for. It substitutes for the expressed wish of the Society, a much more comprehensive and sweeping wish of the Committee. The action asked for, would require all census reports, statistical documents and the *Congressional Record* to be translated before issue, into a tongue unknown to the general public and a majority of professional men, and would forbid the use of any explanation of that tongue, in the documents.

Upon this resolution, there were 18 votes yes, 96 votes no, and 5 blank.

IV.—Resolved, that a committee of five be appointed by the President, to consider and report upon what is the best system of weights and measures, for the use of engineers in the United States; that this committee have power to confer with committees from other societies for a like purpose, and that the foregoing be submitted to this Society, to be acted upon by letter ballot.‡

* Proposed by Clemens Herschel, page 46. † Page 47. ‡ Proposed by Theodore G. Ellis, page 48.

ARGUMENT FOR.—Before this Society advocates the adoption of any particular new system of weights and measures, it is desirable to ascertain, if possible, what is the best system for engineers, independent of what is best for physicians, apothecaries and men of science generally.

It is desirable to have a committee which can investigate and report, so that the Society may be informed as to the wisdom of these

conclusions and discuss any project proposed, without committing the Society as a body.

It is also desirable to have a committee which can correspond with any home or foreign society having the same object in view.

ARGUMENT AGAINST.—The resolution calls for an immense and expensive undertaking by individuals, for whose labors no compensation is provided.

Upon this resolution, there were 47 votes yes, 70 votes no, and 2 blanks.

V.—(As proposed.) Resolved, that the reading of papers on engineering subjects shall not form part of the proceedings of the Society at the regular meetings held during its Annual Conventions, and that special meetings, for the purpose of hearing and discussing such papers, may be held during the Conventions only when authorized by a two-thirds vote of members of the Society present at one of the sessions of the Convention.*

(As amended by proposer.) Resolved, that papers on engineering subjects shall not be read at the regular sessions of the Annual Conventions, unless they pertain to subjects previously announced for discussion during such sessions; but special sessions may be called for the purpose of hearing and discussing such papers as do not fall within this class, when approved by a two-thirds vote of those present at any regular session.

ARGUMENT FOR.—One principal object of the Annual Convention is to afford facilities for social intercourse and interchange of views among members who during the rest of the year are widely separated. The reading of long papers containing matter not previously presented for consideration is not favorable to the accomplishment of this object. No matter how able a paper may be, its full scope can not be grasped by a person listening for the first time to its oral presentation, particularly if it contains much mathematical discussion.

If however, any work has been done, or discovery made, which is of absorbing interest, a special session can be called by a two-thirds vote, to hear it described and discussed.

ARGUMENT AGAINST.—The first part of the

resolution is unnecessary, being fully covered by the rules for the government of Conventions, adopted December 2d, 1874.†

The second part is both unnecessary and unjust. The two thirds rule proposed, might prevent the consideration of a subject which would be of interest to at least half of the members present.

The multiplication of written and rigid rules for governing the Convention, is to be avoided. As the laws now stand, no one is compelled to listen to what does not interest him, nor is any one debarred the privilege of attending to what does interest him.

The existing rule above referred to, would, if enforced by the officers of the Convention, cut off tedious debate more effectively than the one now proposed.

Upon this resolution, there were 25 votes yes, 90 votes no, and 4 blank.

VI.—Resolved, that the Conventions of the Society be divided into three sections, and that the professional papers be read before the several

* Proposed by W. Sooy Smith, page 51. There being some ambiguity in the form of this resolution—as there are no papers read at the “regular meetings held during its Annual Convention”—it was thought best by the Board of Direction to confer with the author, and he submitted August 14th, 1877, the amended form of the resolution for action. † Vol. 1, page 172.

sections, as they may be appropriate ; that the Convention shall adjourn from time to time, to give sections time for their meetings, and that the members, writing papers be required to indicate to what sections they pertain.*

ARGUMENT FOR.—1. Such a division would have the advantage that it would enable members, who attend the Convention, to hear those papers and discussions only, which pertain to subjects in which they are interested, without being obliged to spend much time and endure more or less fatigue in listening to matters in which they are not concerned.

2.—There is seldom sufficient time, at the Conventions, to hear more than a small portion of the papers and discussions appointed for such occasions, and by *dividing* into sections, the effect would be to *multiply* the time which can be devoted to each.

3.—Allowing members the privilege of hearing subjects, with which they are not familiar, discussed by experts, is not usually a great advantage.

4.—The practice in the meetings of other scientific societies, of separating into sections, indicates that experience has demonstrated its advantages, when the topics discussed cover a wide range, as they do, in the meetings of a Society of Civil Engineers.

ARGUMENT AGAINST.—1. The resolution is too vague, not specifying the object of the "sections."

2.—It is too precise, limiting the "sections" to three.

3.—The simultaneous meeting of different sections will debar many members from hearing discussions, in which they are interested.

4.—It provides a rigid law for what had better be left to the Convention to arrange for itself, if it should feel so inclined.

Upon this resolution there were 17 votes yes, 96 votes no, and 6 blank.

Mr. Croes offered for consideration at the Annual Meeting, the following, with the remark that it was but a statement of what the Secretary had done the past four years.

Resolved,—the duties of the Secretary are as follows :—

He shall attend all meetings of the Society, Board of Direction and Standing Committees and record the proceedings.

He shall report and collate discussions on professional topics, conduct the correspondence, edit the publications and superintend the printing of the Society, issue all notices, make the collections, keep the books of account, countersign all bills and receipts, prepare monthly estimates of expenditures for appropriation by the Board of Direction, and present the vouchers for inspection and approval.

He shall be the Librarian of the Society, have charge of the Library and see that all books are marked with the name of the Society and recorded in a catalogue.

He shall have charge of the Society's house or rooms, and whenever practicable, shall reside on the premises.

He shall make an annual report to the Board of Direction at the Annual Meeting, with an inventory of the Society's possessions, (except its funds,) shall engage and be responsible for all assistants employed by him—and generally ;—

He shall conduct the ordinary business of the Society, with the advice and under the instruction of the Standing Committees in reference to their respective departments, and as the Board of Direction may from time to time prescribe.

* Proposed by Caleb G. Forshey, page 52.

The Society adjourned to meet Thursday, October 18th, for the transaction of regular business; the stated meeting to be held at the same time.

OF THE BOARD OF DIRECTION.

SEPTEMBER 5TH, 1877.—A stated meeting was held at eleven o'clock A. M.

Applications for admission to the Society were taken up and other business was done.

OCTOBER 2D, 1877.—An adjourned meeting was held at ten o'clock A. M.

A report from the Committee to nominate officers of the Society for year 1877-8, was presented and acted upon; applications for admission to the Society were considered and other business was done.

NOTES AND MEMORANDA.

ADOPTION OF THE METRIC STANDARDS.

A CARD* TO THE VOTING MEMBERS of the American Society of Civil Engineers:

Your attention is respectfully invited to two facts, viz.:

1st. The Committee which submitted, at the Ninth Annual Convention at New Orleans, the draft of a memorial relative to metric weights and measures, was appointed under the following resolution:

"Resolved, that the American Society of Civil Engineers will further, by all legitimate means, the adoption of the metric standards in the Office of Weights and Measures at Washington, as the sole authorized standards of weights and measures in the United States; that the Chair appoint a committee of five to report to the Society a form of memorial to Congress in furtherance of the object expressed, and that the foregoing be submitted to the Society and voted on by letter ballot."

So far as the Chairman can judge, he fully believes that the members of the committee

were unanimous in the opinion that it was their duty to report a form of memorial suitable for presentation to Congress; a memorial whose adoption by the American Society of Civil Engineers would further the adoption of the metric system as sole standard in the United States, and that all means proposed to be employed by the Society must be legitimate.

2d. The United States standard weights and measures are preserved in the United States Coast Survey Office, Bureau or Office of Weights and Measures, in charge of J. E. Hilgard. In a letter of November 19th, 1875, Prof. Hilgard writes: "About the functions of the Office of Weights and Measures in Washington, I will write next week:" and in a letter November 21st, 1875: "The United States Office of Weights and Measures owes its existence to the fact," &c., and "this Bureau or Office is thus a branch of the Treasury Department, and a part of the Coast Survey Office."

CLEMENS HERSCHEL,

Member, American Society

of Civil Engineers.

Boston, Sept. 7th, 1877.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Aerial World, a popular Account of the Phenomena and Life of the Atmosphere. C. Hartwig. New ed. London. 8vo. Longmans, 10s. 6d.
Animals, the Fur-Bearing.—of North America. Elliott Coues, Boston. Estes & Lauri t. (Announcement.)

Archaeological Researches. Excavations at Carnac (Brittany): a Record of — in the Bosseno and the Mont Saint Michel. J. Milu. Edinburgh.

Historical and descriptive Account of the old Stone Crosses of Somerset. C. Pooley. London. 8vo. illus. Longmans, 36s.

- Architect. Notes and Sketches of — in the Northwest of Europe. Felix Narjoux. Boston. 8vo. illus. *Osgood*. \$3.00.
- Architecture. Lectures on — E. Viollet le-Duc. Trans. from the French, by B. Bucknell. Vol. I. London. 8vo., illus. *Low & Co.* 31s. 6d.
- Art applied to household Furniture. Harriet P. Spofford. New York, illus. *Harpers*. (Announcement.)
- , a Sketch of its History, Theory, Practice and Application to Industry. M. D. Wyatt. London. 8vo. *Macmillan & Co.* (*New York*) 5s.
- Astronomical Observatory at Harvard College, Annals of — Vol. VIII. Results of Observations made or directed by W. C. Bond, G. P. Bond, and J. Winlock. Part 1. Historical Account of the Observatory from October, 1855, to October, 1876. Part 2. Astronomical Engravings of the Moon, Planets, etc., and illustrating Solar Phenomena. Boston. *Ginn & Heath*. (Announcement.)
- Boilers, Deterioration of —. Evidence before Committee. (Parliamentary report.) London. 8vo. 11s.
- Botany, the different Forms of Flowers on Plants of the same Species. Charles Darwin. English Reprint. New York. 12mo. *Scribner, Welford & Armstrong*. (Announcement.) \$6.00.
- Butterflies of North America. W. H. Edwards. Vol. I. New York. 4to, illus.
- Calculus, differential —. J. M. Rice. New York. *Wiley & Sons*. (Announcement.)
- Canals. Annual Report of the State Engineer and Surveyor on the — of State of New York. Feb. 15, 1877. Albany. 8vo. maps.
- , Suez —. Further Papers. (Parliamentary Report.) London. 8vo. 2 Parts. 1s. 2d.
- Catalogue. The Publishers' Trade-List Annual for 1877, preceded by the first provisional Supplement to the American Catalogue (being a Reference List of Books recorded in *Publishers' Weekly* from July 1, 1876, to June 30, 1877, with additional Titles, Corrections, Changes of Price and Publishers, etc.), and the American educational Catalogue for 1877: 5th year. New York. 8vo. *Publishers' Weekly*. \$1.50.
- Caves. Notes on the Barrows and Bone Caves of Derbyshire, with an Account of a Descent into Eldon Hole. R. Penington. London. 8vo. *Macmillan & Co.* (*New York*) 6s.
- Census of Massachusetts, 1875, prepared under Direction of Carroll D. Wright. 3 Vols. I. Population and social Statistics. II. Manufactures and Occupations. III. Agricultural Products and Property. Boston. 8vo.
- Centennial Exhibition of 1876. General Views of the United States Government Building and Contents. S. C. Lyford, Ordnance Department, U. S. A. Boston. 4to, illus. *Osgood & Co.*
- Official Reports of the International Board of Judges. Ed. by Francis A. Walker. Group II. Pottery, Porcelain, etc. \$1.50. —Group V. Fish and Fishing Products, etc. \$0.25. —Group VI. Timber, Lumber, etc. \$0.25. —Group VII. Furniture, Upholstery, etc. \$0.25. —Group VIII. Cotton Fabrics, etc. \$0.50. —Group XI. Jewelry, etc. \$0.25. —Group XIII. Printing, Stationery, etc. \$0.50. —Group XVI. Military and Sporting Arms, etc. \$0.50. —Group XIX. Vessels and Apparatus of Transportation, etc. \$0.25. —Group XXII. Sewing Machines, etc. \$0.50. —Tests of Turbine Water Wheels. \$0.25. —Tests of Steam Boilers. \$0.25. —Trial of Steam Fire Engines. \$0.25. Philadelphia. 8vo. *Lippincott & Co.*
- Official Reports of the International Board of Judges. Ed. by Francis A. Walker. Group I. Minerals, etc. \$1.50. —Group III. Chemistry and Pharmacy. \$1.50. —Group IV. Animal and Vegetable Products. \$1.50. —Group IX. Wool and Silk Fabrics, etc. \$1.00. —Group X. Clothing, fancy Articles, etc. \$0.75. —Group XII. Leather, Boots, etc. \$0.75. —Group XIV. Apparatus for Heating, etc. \$1.00. —Group XV. Builders' Hardware, etc. \$0.25. —Group XVII. Carriages, etc. \$0.25. —Group XVIII. Railway Plant, Rolling Stock, etc. \$1.25. —Group XX. Motors, etc. \$1.50. —Group XXI. Machine Tools, etc. \$0.25. —Group XXIII. Agricultural Machines, etc. \$0.75. —Group XXIV. Instruments of Medicine, Surgery, etc. \$1.00. —Group XXV. Musical Instruments, etc. \$1. —Group XXVI. Agriculture and Engineering. \$0.75. —Group XXVII. Plastic and graphic Art. \$0.75. —Group XXVIII. Education and Science. \$1.00. —Group XXIX. Horticulture. \$0.25. —Groups XXX to XXXV. Live-Stock. \$0.75. —Group XXXVI. Pomology. \$0.25. —Collective Exhibits. \$0.25. Philadelphia. 8vo. *Lippincott & Co.* (Announcement.)
- Reports of British Commission. (Parliamentary.) London. 8vo. 1 Vol. texts. 1 Vol. plans. 11s. 6d.
- Ceramic Art, a History of —, a descriptive and philosophical Study of the Pottery of all Ages and all Nations. Albert Jacquemart. New ed. New York. 8vo. illus. *Scribner, Welford & Armstrong*. \$10.50.
- Chemistry, inorganic —, for Students in elementary Classes of the Science and Art Department. W. B. Kemshead. (Collins' elementary Series.) Enl. ed. London. 12mo. *Collins*. 1s. 6d.
- Part II. — The Metals. Comp. by J. C. Thorpe. (Advanced Science Series.) New York. 12mo, illus. *Putnam*. \$1.50.
- System of volumetric Analysis. Emil Feischer. Trans., with Notes and Additions, from 2d German Ed., by M. M. Pattison Muir. London. 8vo. *Macmillan & Co.* (*New York*) 7s. 6d.
- Treatise on —. H. E. Roscoe and C. Schorlemmer. Vol. I. The non-metallic Elements. London. 8vo. illus. *Macmillan* (*New York*) 21s.
- Civil Engineers, Minutes of Proceedings of the Institution of —, with other selected and abstracted Papers, ed. by James Forrest, Vol. XLIX. Sessions 1876-1877. Part 3. London. 8vo, illus. *Inst. Civil Eng.*
- , Proceedings of the Swedish Society of —. Vol. XLI. Part 2. Stockholm. 4to, illus. (Swedish.)
- Concrete: its Use in Building and the Construction of Walls, Floors, &c. Thomas Potter. London. 8vo, illus. *Spons.* (*New York*) 4s.
- Conic Sections, the Book of —, treated geometrically, with an elementary Treatise on Analytical Geometry. F. Harrison. London. 8vo. *Stewart & Co.* 1s.
- Cotton Goods, Sizing of —, and the Causes and Prevention of Mildew. W. Thomson. Manchester. 8vo. *Palmer & Howe*. 7s. 6d.
- Spinner, the practical —. M. Scott. 9th ed., rev., with add. Examples and Tables, adapting the Work to modern Practice. Manchester. 8vo. *Heywood*. 12s.

- Cyclopædia, general Index to the American —. Dr. Conant. New York. 8vo. *Appletons*. (Announcement.)
- Drawing Books, illustrated.—Mark M. Maycock. In 8 vols. Vols. V and VII. Buffalo. M. Taylor. (Announcement.)
- How to Draw a Straight Line, a Lecture on Linkages. A. B. Kempe. (Nature Series.) London. 8vo, illus. *Macmillan*. (New York.) 1s. 6d.
- Industrial —. D. H. Mahan. New ed., rev. and enl. by D. F. Thompson. New York. *Wiley & Sons*. \$3.50.
- Linear, Perspective and Model —, a School and Art Class Manual. Laurence Anderson. London. 4to, illus. *Macmillan*. New York. (Announcement.)
- Education, the Cyclopædia of —, by Henry Kiddle and Alexander J. Schem. New York. 8vo. *Steiger*.
- Encyclopædia Britannica, a Dictionary of Arts, Sciences and general Literature. 9th ed. (American Reprint.) Vols. V, VI. Philadelphia. 8vo, illus. *Stoddart*. \$5.00 per vol.
- Engineering Construction, a Treatise on —, embracing Discussions of the Principles Involved and Descriptions of the Materials Employed in Tunnelling, Bridging, Canal and Road Building, etc. J. E. Shields. New York. 12mo, illus. *Van Nostrand*. \$1.50.
- Papers, Abstracts of —, in foreign Transactions and Periodicals, ed. by James Forrest. (Minutes of Proceedings, Institution of Civil Engineers. Vol. XLVIII.) London. 8vo. *Inst. Civil Eng.*
- Engineers' and Contractors' Illustrated Book of Prices and Engineers' Directory for 1877-8. London. 4to. *Spons* (New York). 7s. 6d.
- Printed Papers of the Essayons Club of the Corps of —, read during Winter of 1876-77. Nos. XL-XLIV. Willets Point. 4to.
- Proceedings of the Austrian Society of — and Architects. Vol. XXIX. Part 7. Vienna. 4to, illus. (German.)
- Proceedings of the Society of — and Architects of Hanover. Vol. XXIII; Part 3. Hanover. 4to, illus. (German.)
- Transactions of the North of England Institution of Mining and Mechanical —. Vol. XXVI. Part 4. Newcastle-on-Tyne. 8vo, illus.
- Ephemeris, the American — and nautical Almanac for Year 1880. Ed. by J. H. C. Coffin. Washington. 8vo. *Gov. Printing Office*.
- Fern World, (the). Francis G. Heath. London. 8vo, illus. *Low*. 12s. 6d.
- Ferns, British and foreign; the History, Organography, Classification, and Enumeration of the Species of Garden Ferns, with a Treatise on their Cultivation, etc. John Smith. Enl. ed. (London Reprint.) New York. 8vo, illus. *Putnam*. (Announcement.) \$3.50.
- Floods in the River Thames, Prevention of —, (Parliamentary Report.) London. 8vo. 8s.
- Gas Companies, (Metropolis). Accounts for 1876. (Parliamentary Report.) London. 8vo. 4d.
- Geography, elementary Lessons in physical — Archibald Geikie. London. 16mo, illus. *Macmillan*. (New York). \$1.75.
- Geology, Class Book in —. J. S. Newberry. New York. *Appletons*. (Announcement.)
- Elements of —. Jos. Le Conte. New York. *Appletons*. (Announcement.)
- Geometry, Elements of —. George A. Wentworth. Boston. *Ginn & Heath*. (Announcement.)
- Gunnery, Manual of —, for Her Majesty's Fleet, with Alterations to January 1st, 1877. London. 16mo. (British Gov. Publication.) 2s.
- Health, the Public Health Act, 1875 (38 & 39 Vict., Cap. 55), and the Rivers Pollution Prevention Act, 1876 (39 & 40 Vict., Cap. 75). Text of the Queen's Printers' ed., preceded by a complete Index. F. Stratton. London. 8vo. *Knight*. 3s.
- Heat, an elementary Treatise on —, in Relation to Steam and the Steam-Engine. G. Shann. London. 8vo, illus. *Macmillan*. (New York. Announcement.)
- Heliotype Process, (the). E. Edwards. Boston. 4to, illus. *Osgood*.
- Indicator Diagram practically Considered. N. P. Burgh. 5th ed. London. 8vo. *Spons*. (New York.) 6s. 6d.
- Industrial Art: a monthly Review of technical and scientific Education at Home and Abroad. No. 1. London. 4to. *Hardwicke*. 1s.
- Infantry, a Key to the Field Exercise and Evolutions of —, as revised in 1877. With Plates of Attack Formations. W. D. Malton. London. 16mo. *Clowes*. 1s.
- Insects, our common —. A. S. Packard. New ed. Boston. illus. *Estes & Lauriat*. (Announcement.) \$1.50.
- Invertebrates, Huxley's Manual of —. New York. *Appletons*. (Announcement.)
- Iron Smelter's Pocket Analysis Book. Thomas Whitwell. London. 16mo. *Trubner*. 5s.
- Labor and Capital, the Question of —. John B. Jervis. New York. 12mo. *Putnam*. \$1.25.
- Latitude, Tables for finding — of a Place by Altitudes of Polaris. Supplement to American Ephemeris and Nautical Almanac for year 1880. Ed. by J. H. C. Coffin. Washington. 8vo. *Gov. Printing Office*.
- Least Squares, an elementary Discussion of the Principles of —, Reprinted from Journal of the Franklin Institute. Mansfield Merriman. Philadelphia. 8vo. *Franklin Institute*.
- , Elements of the Method of —. Mansfield Merriman. London. 12mo. *Macmillan* (New York). \$2.50.
- Light, a Series of simple, entertaining and inexpensive Experiments in the Phenomena of Light. (Vol. I. experimental Science Series for Beginners.) Ed. by Alfred M. Mayer as't by Charles Barnard. New York. 12mo, illus. *Appletons*. \$1.00.
- Locomotive Engine Driving from the Foot Plate, a practical Manual for Engineers in Charge of Locomotive Engines. Michael Reynolds. London. 12mo, illus. *Lockwood, Crosby & Co.* 4s. 6d.
- Mathematics, the American Journal of pure and applied —. Ed. by J. J. Sylvester and W. E. Story. Published under Auspices of the John Hopkins University. Quarterly. Baltimore. 4to. (Announcement.) Per year. \$5.00.
- Measuring Machine, the Whitworth—including Descriptions of the Surface Plates, Gauges, and other measuring Instruments made by Joseph Whitworth. T. M. Goodve and C. P. B. Shelly. London. 4to, illus. *Longmans*. (Van Nostrand, New York.) \$10.00.
- Mechanics, adapted for the extra Subject of the New Code. H. Evers. London. 12mo. *Collins*. 6d.

- Book of —. Part I: Statics. R. O. Thorpe. London. 12mo. *Stewart*. 1s.
- , elementary Principles of—. Devolson Wood. New York. *Wiley & Sons*. (Announcement.)
- Microscope, practical Hints on the Selection and Use of —. 2d ed., enl. John Phin. New York. 12mo, illus. *Ind. Publishing Co.* \$0.75.
- Mississippi River, Report on the Physics and Hydraulics of —, upon the Protection of the alluvial Region against Overflow, and the Deepening of the Mouths. Reprinted with Additions. No. 13. Professional Papers Corps of Engineers, U. S. A. A. A. Humphreys and H. L. Abbot. Washington. 4to, illus. *Gov. Printing Office*.
- , Seventh Report upon the Improvement of the South Pass of the Mississippi River, showing Conditions of Works, July 24, 1877. M. R. Brown. Washington. 8vo, illus. *Gov. Printing Office*.
- Money and legal Tender in the United States. Henry R. Linderman. New York. 12mo. *Potnam's*. (Announcement.)
- Naturalists' Guide in Collecting and Preserving Objects of natural History, with a complete Catalogue of the Birds of eastern Massachusetts. C. J. Maynard; illus. by E. L. Weeks. Rev. ed. Salem. 12mo. *Naturalists' Agency*. \$2.00.
- Natural History and Antiquities of Selborne. Gilbert White. New ab'd ed. London. 12mo, illus. *Routledge*. (New York. Announcement.) \$1.75.
- Philosophy, Elements of—. A. E. Dolbear. Boston. *Ginn & Heath*. (Announcement.)
- Nautical Terms and Phrases, for naval and mercantile Officers, Engineers, shipowners, Merchants, Shipbrokers, Travelers, &c. E. Poinin. London. *Simpkin*. (Van Nostrand. New York.) 8vo. \$2.00.
- Navigation and Shipping. Statement, 1876. (Parliamentary Report.) London. 8vo. 3s. 6d.
- Optics, the undulatory Theory of—, for Use of Students in the University. G. B. Airy. New ed. London. 8vo. *Macmillan*. (New York.) 6s. 6d.
- Painting, a Treatise on—, Leonardo da Vinci. From the Italian by John Francis Rigaud; with Life of Leonardo and Account of his Works by John W. Brown. New ed. rev. London. 12mo. \$2.00.
- Parks and Gardens of London, the Royal—their History and Mode of Embellishment, with Hints on the Propagation and Culture of the Plants employed, the artistic Arrangement of Colors, &c. Nathan Cole. London. 8vo, illus. *Journal of Horticulture Office*. 5s.
- Philosophy, modern Philosophy from Descartes to Schopenhauer and Hartmann. Francis Bowen. New York. 8vo. *Scribner, Welford & Armstrong*. \$3.00.
- recent British—; a review with Criticisms. D. Masson. 3d ed., with add. Chapter. London. 8vo. *Macmillan*. (New York.) 6s.
- Polaris, Navigation of the North Sea Expedition. U. S. Ship Polaris. Ed. by C. H. Davis. Washington. 8vo, illus. *Gov. Printing Office*. New York. *Appletons*.
- Pottery and Porcelain. Charles W. Elliott. New York. *Appletons*. (Announcement.)
- Printing, the Invention of—, a Collection of Facts and Opinions descriptive of early Prints and Playing Cards, the Block Books of the 15th Century, the Legend of Lourens, Janszoon Coster of Haarlem, and of the Work of John Gutenberg and his Associates. Theo. L. De Vinne. New York. 8vo, illus. *Francis Hart & Co.* \$10.00.
- Pumping Engine, the Whiston ——. St. Helens, Lancashire. Thomas S. Stooke. (Excerpt Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. *Inst. Civil Eng.*
- Punctuation, a Handbook of—, containing the more important Rules, and an Exposition of the Principles upon which they depend. Joseph A. Turner. New rev. ed. Philadelphia. 16mo. *Lippincott*. \$0.75.
- Pyramid, Philitis, or Solution of the Mystery which for 4000 Years has shrouded the Great Pyramid in Egypt. Charles Casey. 4th ed. Dublin. 8vo. *Carson*. 2s.
- Railroad. Report of Milton Courtright, Chief Engineer of the New York Elevated—, June 1, 1877. New York. 8vo.
- Railway. Report of Surveys and preliminary Operations on the Canadian Pacific—up to January, 1877. Sandford Fleming, Engineer in Chief. Ottawa. 8vo, illus.
- The Midland—its Rise and Progress. Frederick S. Williams. 3d ed. London. 8vo. *Bemrose*. 21s.
- Railways. Permanent Way, rolling Stock, and technical Working of—, followed by an Appendix on Works of Art. Charles Couche. Trans. from the French by James N. Shoolbred. 4 vols. London. *Dulau & Co.* Vol. I. 4to. text, atlas of plates. 40s.
- Victorian —. (Parliamentary Report.) London. 8vo. 8d.
- Rigger's Guide, and Seaman's Instructions for Rigging Ships in Rope or Wire. C. Bushell. 6th ed. London. 12mo. *Simpkin*. 3s.
- Sanitary Condition of City and Country Houses. George E. Waring, Jr. New York. 18mo, illus. (Van Nostrand's Science Series.) *Van Nostrand*. \$0.50.
- Science, Manchester—Lectures for the People. 8th Series, 1876-7. Profs. Roscoe, Williamson and Lockyer. London. 12mo. *Macmillan*. (New York.) \$0.75.
- Principles of—. W. S. Jevons. London. 12mo. *Macmillan*. (New York.)
- Warfare of—, with prefatory Note by Prof. Tyndall. Andrew D. White. 2d ed. London. 8vo. *Henry S. King*. 3s. 6d.
- Sciences, a Vocabulary of philosophical—, including the Vocabulary of Philosophy, mental, moral and metaphysical, by William Fleming, from 2d and 3d ed., ed. by Henry Calderwood. Charles P. Krauth. New York. *Sheldon & Co.* \$3.50.
- Sewage, Purification of Water-carried—. Data for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John C. Melliss. New York. 8vo. *Potnam's*. (Announcement.)
- Shipping Telegram Code. London. *Norie & Wilson*. 25s.
- Star Atlas for the Library, School and Observatory. (new). Richard A. Proctor. New York. 8vo. *Potnam's*. \$2.50.
- Gazing, past and present. Prof. Lockyer. London. *Macmillan*. (Announcement.)
- Half Hours with—. Richard A. Proctor. 8th ed. London. 4to, illus. *Hardwicke & Bogue*. 5s.
- Statics, Treatise on—, containing some of the fundamental Propositions in Electro-

- Statics. G. M. Minchin. London. 8vo. Longmans. (Van Nostrand. New York.) \$5.25.
- Steam-Engine, the Theory and Action of —, for practical Men. W. H. Northcott. London. 8vo, illus. Cassel, Pether, & Galpin. (New York.) \$3.50.
- Surveyors, general Instructions for hydrographic —. (British Gov. Publications.) London. 8vo. 1s.
- Traies for the Use of Engineers and Architects. C. J. Bellamy. 2d ed. London. 8vo. Stanford. 15s.
- Thames, the River —. John B. Redman. With Abstract of Discussion. (Excerpt Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. Inst. Civil Eng.
- Tunnel Construction and the Sydenham Tunnel, London, Chatham & Dover Railway. A. E. Baldwin. (Excerpt Minutes of Proceedings, Institution of Civil Engineers.) London. 8vo, illus. Inst. Civil Eng.
- Water Purification, Hand Book of —, for the Guidance of Corporations, local Boards of Health, and sanitary Authorities. Henry Robinson and John C. Melliss. London. 8vo, illus. (Van Nostrand. New York.) \$7.50.
- Supply. Report on the various Projects for the — of San Francisco,

made to Board of Water Commissioners by George H. Mendall, Engineer. San Francisco. 8vo, map.

Works. Annual Report of Board of Water Commissioners of Toronto, and Report of Chief and Consulting Engineer. Toronto. 8vo.

Wealth. Economics, or the Science of Wealth, a Treatise on Political Economy, for use of Schools, Colleges and the general Reader. J. M. Sturtevant. New York. 8vo. Putnam's. \$1.75.

Enquiry into the Nature and Causes of the Wealth of Nations. Adam Smith. New ed. New York. 8vo. Putnam's. (Announcement.) \$2.00.

How shall the Nation regain Prosperity; a Discussion of the Elements and Amount of our national Wealth, and the Causes and Remedies for the present industrial, commercial, and financial Depression. David A. Wells. New York. 8vo. Putnam's. (Announcement.)

Weather Warnings for Watchers, with concise Tables for calculating Heights. London. 12mo. Houlston. 1s.

Works. Metropolitan Board of —. (Parliamentary Report.) 1876. London. 8vo, 1s. 3d.

Yachtman's Handy Book for Sea Use. W. H. Rosser. London. 8vo. (Van Nostrand. New York.) \$1.75.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From American Institute of Architects, New York:
- Proceedings of the Ninth Annual Convention of the Institute, held in Philadelphia, Oct. 11 and 12, 1876. New York.
- From American News Co., New York:
- The American Bookseller, from July, 1877. A semi-monthly. New York.
- From American Vulcanizing Wood and Lumber Co., New York.
- Art of Seasoning and Preserving Wood and Lumber by Vulcanizing. New York, 1877.
- From Austrian Society of Engineers and Architects, Vienna:
- Journal of the Society. Vol. XXIX. Parts VII and VIII. Vienna, 1877.
- From E. P. Boon, New York:
- Catalogue of scientific Pamphlets, for sale by E. P. Boon, Agent. New York, 1877.
- From J. C. Campbell, New York:
- Regulations establishing a Scale of Water Rents for City of New York. May 1, 1876.
- From O. Chanute, New York:
- Portion of a Spruce Pile driven in 1870 at Weehawken, in North River Dock, eaten off by *Teredo Navalis* at surface of the Mud, by December, 1876.
- From A. J. Chapke, St. Louis, Mo.:
- Report of Board of Water Commissioners of City of St. Louis, with Chief Engineer's Reports for Years 1865 to 1876. St. Louis.
- From Claxton, Remsen & Haffelfinger, Philadelphia:
- Treatise on the Use of Belting for the Transmission of Power. J. H. Cooper, Philadelphia, 1877.

From J. H. C. Coffin, Washington:

American Ephemeris and Nautical Almanac for 1880. Washington, 1877.

Tables for Finding the Latitude of a Place by Altitudes of Polaris. Washington, 1877.

From F. Collingwood, New York:

Specifications for Granite Face, Arch and other Stone, required for the New York and Brooklyn Approaches to East River Bridge.

From the Committee of Publication, Vienna:

Journal of Artillery and Military Engineering, from January, 1877; a Monthly. (German.)

From J. J. R. Croes, New York:

City of New York. Department of Public Parks. Proposals for constructing Sewers in Brook Avenue, in Mott Haven and in 143d Street. Separate numbers. New York, 1877.

From D. Draper, New York:

Report of the Director of the New York Meteorological Observatory, Department of Public Parks, for Year 1876. D. Draper.

From E. Edwards, Boston:

The Heliotype Process. Boston, 1877.

From C. E. Emery, New York:

Report of the trial of Steam Machinery of U. S. Revenue Steamer "Gallatin" in Dec. and Jan'y, 1874-5. Washington. (Copies for distribution.)

From Essayons Club of the Corps of Engineers. Willet's Point, N. Y.:

Printed Papers of the Club, read during the Winter of 1876-7, being: XL—The Shock at Hallet's Point; Gen. Abbot. XLI—Station Errors near 49th Parallel; Lieut. Greene.

- XLII—Two Levels in Zenith Telescope Method: Lieut. Bailey. XLIII—Notes on Magnetic Determinations, and, XLIV—Notes on Distribution of Magnetism; Capt. Raymond.
- From J. T. Fanning, Manchester, N.H.: Treatise on Water Supply Engineering, relating to Hydrology, Hydro Dynamics, and Construction of Water Works in North America. J. T. Fanning. New York, 1877.
- From S. Fleming, Ottawa, Can.: Report of Surveys and preliminary Operations on Canadian Pacific Railway, to January 1st. S. Fleming, Engineer in Chief. Ottawa, 1877.
- From D. M. Greene—another copy from J. D. Van Buren, Jr.—Albany, N. Y.: Annual Report of State Engineer and Surveyor, on Canals of the State. February 15, 1877. Albany.
- From P. C. Haines, Engineer Secretary, Light House Board, Washington: List of Beacons, Buoys, Stakes, Spindles, and other Day and Night Marks, in 1st, 3d, 4th, 5th, 6th, 8th, 10th, 11th, 12th, and 13th Light House Districts. Washington.
- From Hanover Society of Engineers and Architects, Hanover: Catalogue of Royal Polytechnic School of Hanover for 1877-8. (German.) Journal of the Society. Vol. XXIII. Part 3. 1877. (German.)
- From Gen. A. A. Humphreys, Chief of Engineers, U. S. A., Washington: Report upon Physics and Hydraulics of Mississippi River, on Protection of the alluvial Region against Overflow, and on Deepening of the Mouths. Reprinted, with Additions. A. A. Humphreys and H. L. Abbot. Washington, 1876.
- Seventh Report upon Improvements of South Pass of the Mississippi River, showing Condition of Works. July 24th, 1877. M. R. Brown. (Copies for distribution.)
- From Institution of Civil Engineers, London: Excerpts from Minutes of Proceedings, Sessions 1876-7, as follows: Abstracts of Papers in foreign Transactions and Periodicals. Economical Method of manufacturing Charcoal for Gunpowder. George Haycraft. With Abstract of Discussion. History of the modern Development of Water-Pressure Machinery. William G. Armstrong. With Abstract of Discussion. Street Tramways. R. Souttar. With Abstract of Discussion. The River Thames. J. B. Redman. With Abstract of Discussion. Tunnel Construction, and the Sydenham Tunnel, London. Chatham & Dover Railway. A. E. Baldwin. Whiston Pumping Engine, St. Helen's, Lancashire. F. S. Storke. Minutes of Proceedings, with other selected and abstracted Papers. Sessions 1876-7. Part 3, Vol. XLIX.
- From Iron and Steel Institute, London: Journal of the Institute. 1877. London.
- From J. B. Jervis, Rome, N. Y.: The Question of Labor and Capital. J. B. Jervis. New York, 1877.
- From C. Latimer, Cleveland, O.: Atlantic & Great Western Railway. Comparative Statement of Expenses in Engineering Department. May and June, 1876 and 1877. 2 sheets.
- From Louisiana Cotton Tie Co., New Orleans: Treatise on the Rationale of compressing Cotton. S. H. Gilman. New Orleans.
- From G. H. Mendell, San Francisco: Report on the various Projects for Water Supply of San Francisco. G. H. Mendell, Chief Engineer. 1877.
- From M. Merriman, New Haven, Conn.: Elementary Discussion of the Principle of Least Squares. M. Merriman. Philadelphia, 1877.
- From R. J. Morrison, New York: The City Record. Vol. V, Part 2. New York, 1877.
- From New York Elevated R. R. Co., New York: Rapid Transit Meeting at Chickering Hall. New York, 1877.
- Rapid Transit Meetings at Lion Park, Harlem Association, Chickering, and Parepa Halls, and Trinity Building. New York, 1877.
- Reports of the President and of the Chief Engineer, June, 1877. New York. 2 numbers.
- From North of England Institution of Mining and Mechanical Engineers. Newcastle-on-Tyne, England: Charter and By-Laws of the Institution. General Index to Transactions, Vol. I—XXVI, 1852-76. Transactions, April, May and June, 1877. Vol. XXVI, Part 4.
- From J. E. Nourse, Washington: Narrative of the North Sea Polar Expedition, U. S. Ship Polaris. Ed. by Rear Admiral C. H. Davis, U. S. Navy. Washington, 1876.
- From P. A. Peterson, Toronto, Can.: Toronto Water Works. Annual Reports of the Board of Water Commissioners and the Chief Engineer, for 1877. Toronto.
- From G. A. Putnam's Sons, New York: Putnam's Library Companion a quarterly Summary of Publications. F. A. Perkins. New York, 1877.
- From B. Quaritch, London: Catalogue of Periodicals, Transactions of learned Societies, &c., from private Presses and historical Collections. September, 1877. London.
- From F. Rinecker, Wuerzburg, Germany: Mt. Riga Railway. Photographs of a Locomotive and a Train on a Viaduct. Raising a Roof. F. Rinecker. (German. Copies for distribution.)
- From E. G. Schweig, New York: On Uses of Galvanic and Faradic Baths. From Medical Record. New York, 1874.
- From Henry Sharp, London: Correspondence on Application of Steel Plates for Manufacture of Steam Boilers, accompanying Results of Experiments on riveted Joints and Steel Plates. London. Discussion of Treatment of Steel Plates. London, 1868. The Treatment of Steel Plates. Henry Sharp. London, 1868. Results of Experiments on riveted Joints and Steel Plates. D. Kirkaldy, London, 1872.

From T. G. Smith, Buffalo, N. Y.:
 Plumber Fire Proof Elevator—a Lithograph.
 Tolls and Transportation; a free Canal es-
 sential to the State's Prosperity; the Water
 Route superior to Railways. A. Richmond,
 Buffalo, 1877.

From Society of Civil Engineers, Paris:
 Memoirs and Proceedings of the Society.
 May and June, 1877. Paris (French).

From Swedish Society of Civil Engi-
 neers, Stockholm, Sweden:
 Proceedings of the Society. Vol. XLI., Part
 1. Stockholm, 1877 (Swedish).

From W. Steinway, New York:
 Report of Board of consulting Engineers upon
 Plan for New York and Long Island Bridge.
 New York, 1877. Several copies.

From U. S. Naval Observatory, Wash-
 ington:
 Letter to Secretary of Navy, announcing Dis-
 covery of Satellites of Mars. Washington,
 1877.

From D. Van Nostrand, New York:
 New Constructions in graphical Statics. H.
 T. Eddy. New York, 1877.

From A. B. Venable, San Francisco:
 An Act relative to Commissioners of Trans-
 portation of State of California, their Powers
 and Duties, April 3d, 1876. Sacramento.
 6 copies.

Blank Form of annual Report of Railroad
 Companies to Board of Transportation Com-
 missioners, for Year ending June 30, 1877.
 Sacramento. 6 copies.

From J. Wiley & Sons, New York:
 Elementary Course of Civil Engineering for
 Use of Cadets of U. S. Military Academy.
 J. B. Wheeler. New York, 1877.

From D. Williams, N. Y.:
 The Metallurgical Review; a Monthly. Vol.
 I, No. 1. September, 1877. New York.

From miscellaneous Sources:
 Annals of the Ministry of Public Works,
 Mexico, January, 1877 (Spanish). 2 copies.
 Catalogue of technical Literature. Ed. by
 Bruno Kerl. New Series. 1854-1875. 2
 vols. Leipzig. (German).

— of the University of Cincinnati for
 Year 1877-8.
 Report of Department of Public Works, for
 Quarter ending June 30, 1877. New York.

ANNOUNCEMENTS.

MEETINGS OF THE SOCIETY.—An adjourned
 regular and stated meeting, for transaction of
 business and consideration of professional
 topics, will be held Thursday, October 18th,
 at eight o'clock P. M.

The Twenty-fifth Annual Meeting of the
 Society will be held Wednesday, November
 7th, at ten o'clock, A. M. The Annual Report
 of the Board of Direction, on the affairs of
 the Society, including the Report of the Treas-
 urer, will be presented; officers for the en-
 suing year elected; the Norman Medal award-
 ed; time and place of the Tenth Annual Con-
 vention fixed; ballots for members can-
 vassed; action taken upon pending amend-
 ments to the Constitution,* relating to
 the proposal, election, classification, remis-
 sion of dues, prohibition from voting and
 expulsion of members, and to the By-Laws
 relating to adoption of future amendments;
 also upon resolution defining duties of the
 Secretary; and other important business
 done.

Reports from Committees, as follows, will
 be called for;
 Centennial Commission of the Society,

THEODORE G. ELLIS, *Chairman*.
 Gauging of Streams, and
 Nomenclature and Classification of Masonry,
 J. JAMES R. CROES, *Chairman*.
 Metric System of Weights and Measures.

CLEMENS HERSCHEL, *Chairman*.

* For text of these, see pages 50, 51, and 86.
 † For text of this, see page 86.

Permanent Quarters for the Society.

JOHN BOGART, *Chairman*.

Resistance of Railway Trains, and
 Uniform Accounts and Returns of Railroad
 Companies. WILLIAM P. SHINN, *Chair-*
man.

Tests of American Iron and Steel.

W. SOOY SMITH, *Chairman*.

An informal dinner for members of the
 Society and invited guests will be had in the
 evening.

A circular has been sent to members, em-
 bodying this announcement, asking each to
 say whether he will be present at the Annual
 Meeting, and if he will join in the dinner
 proposed; also to state his preference as to
 time and place of the next the Tenth—An-
 nual Convention. Members are requested to
 promptly forward replies to the Secretary.

PAPERS HAVE BEEN PRESENTED since last
 announcement, as follows:

Levees; a Discussion.

J. FOSTER FLAGG, Aug. 25, 1877.

Connected Arc Marine Boilers; a Discussion.

J. FOSTER FLAGG, Aug. 31, 1877.

PAPERS ON ENGINEERING SUBJECTS, giving
 results of practice, or in discussion of per-
 tinent theoretical questions, are desired from
 members of the Society; their comments
 (whether or not present at meetings of the
 Society) upon papers published in Transac-
 tions are solicited, and they are urged to con-
 tribute from note-books and other similar

records whatever may bear upon the subjects considered, or refer to other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, vol. I.

METRIC SYSTEM OF WEIGHTS AND MEASURES.—Attention is called to the following resolution, adopted at the Ninth Annual Convention:

Whereas, the metric system of weights and measures is now extensively used abroad; and whereas, it is desirable that the relation of the units of differing systems be made familiar to all, by comparison:

Resolved, that members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system in connection with those of the system in general use.

LIST OF MEMBERS.

ADDITIONS.

		Date of Election.
ATKINSON, JAMES B.	Sec. and Treas. St. Bernard Coal Co., Earlington, Ky.	Sept. 5, 1877.
BRUSH, CHARLES B.	(Associate to Member), Spielman & Brush, Hoboken, N. J.	" "
BULLOCK, WILLIAM D, [J.]	Ass't Engineer Water Works, Providence, R. I.	" "
GOLAY, PHILIP	Ch. Engineer Miami Valley R'y, Cincinnati, Ohio	" "
HAYWARD, JAMES A.	Drawer 432, New Orleans, La.	" "
HYDE, WILLIAM B.	Oakland, Cal.	July 12, "
PARKHURST, H. W.	Louisiana, Mo.	Sept. 5, "
SPIELMAN, ARTHUR	(Associate to Member), Spielman & Brush, Hoboken, N. J.	" "

CHANGES AND CORRECTIONS.

BISSELL, HEZEKIAH	(Care Am. Soc. Civil Eng's), New York.
BUCK, LEFFERTS L.	(Care W. G. Swan), Suspension Bridge, N. Y.
EMERSON, GEORGE D.	31 Washington place, New York.
GOODWIN, JOHN M.	Eng. Sharpville R. R., Sharpville, Mercer Co., Pa.
HOUSTON, JOHN	Spring Valley, Rockland Co., N. Y.
KNIGHT, WILLIAM B.	Fordham Branch, Post Office New York.
MCGEE, JOHN	(Care O. C. James), Rio Janeiro, Brazil.
MERIWETHER, NILES	Huntsville, Ala.
MOORE, ROBERT	Sewer Commissioner, St. Louis, Mo.
SEDGWICK, THOMAS S.	Chicago, Ill.

RESIGNATIONS.

CABOT, GEORGE D.	Lawrence, Mass.	Oct. 4, 1877.
MITANDER, NILS	New York.	" 3, "

DEATHS.

ENSIGN, E. W. [F.]	(Late of) Buffalo, N. Y.	Oct. 1, 1877.
TYSON, HENRY	" Baltimore, Md.	Sept. 2, "

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III. October, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 18, 1877.—An adjourned regular and stated meeting was held at 8 o'clock P. M.

The appointment of the following committees was announced.

To present memoirs of the life and professional services of deceased members :

Of Robert L. Cooke, deceased, J. J. R. Croes and C. R. Schott ; of Charles S. Emaek, deceased, Martin Coryell ; of Louis Nickerson, deceased, Edward P. North ; of William B. Ogden, deceased, E. S. Cheshbrough and Geo. S. Greene ; of Henry Tyson, deceased, M. N. Forney and William R. Hutton ; the Secretary being also a member of each of these committees.

Committee to provide a dinner on the evening of the annual meeting, John Avery and the President.

The following were offered and seconded :—

Amendment to the By-Laws, proposed by F. Collingwood :—

SECTION 20 to read :—The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction ; he shall draw all checks, which shall be signed by him and the President or Chairman of the Committee on Finance and countersigned by the Secretary.

Substitute proposed by William J. McAlpine :—

SECTION 20 to read :—The Treasurer, before he shall enter upon his duties, shall give a bond for the faithful discharge thereof, to the amount of \$5,000, with sureties therefor who shall be approved by the Com-

mittee on Finance. All moneys which he may receive shall be immediately deposited to the credit of the Society, in such Bank as the Committee on Finance shall direct.

None of the moneys, securities, or other property of the Society shall be paid out or incumbered, except for the payments of bills and accounts which have been duly examined and approved by the Committee on Finance, and no moneys shall be withdrawn except for such duly approved bills and accounts drawn by the Secretary and approved by the Committee on Finance in favor of the person to whom such moneys are due.

Amendment to the By-Laws proposed by Geo. S. Greene :—

SECTION ... (A new Section).—In all cases where the By-Laws, or resolutions of the Society or of the Board of Direction, require specific duties to be performed by the President, the senior Resident Vice-President present shall perform such duties in the absence of the President, on receiving notice from the President to perform such duties.

Additional to resolution offered, October 3d, proposed by G. Leverich :—

The Secretary shall devote his whole time and attention to the service of the Society ; he shall receive therefor a salary of \$2,400 per year, and his assistants shall be paid by the Society, at rates and in gross amount as fixed and appropriated by the Board of Direction.

Substitute for same proposed by Wm. J. McAlpine :—

The Secretary shall be required to devote his whole time and attention to the duties of his office and shall not undertake any other professional duty ; failing in this, he shall vacate his office of Secretary. His salary shall be \$.... per annum, and under no circumstances shall he receive other money except by a vote of the Society. He may nominate an assistant, to whom may be paid \$.... per year ; which nomination must be first submitted to the Board of Direction, and if approved, to a vote of the Society.

Substitute for same proposed by O. Chanute :

The Secretary shall devote his whole time and attention to the service of the Society, and shall not undertake any other professional duty ; he shall therefor receive a salary of \$2,400 per year, out of which he shall pay such assistants as he may employ.

Action on these was deferred until the annual meeting.

The following preamble and resolution were offered by G. Leverich, for consideration at the annual meeting, and if then so ordered, to be submitted in December to the Members, Associates and Juniors of the Society for approval by ballot : each voter to affix his signature, and the canvass and a report to be made at the regular meeting in February :—

Whereas, A Civil Engineer, in the practice of his profession, is sometimes restrained or overruled by his employers, in matters involving serious risk to property and life which he *only*, as the engineer should

determine ; whence he must either discharge his duties in a manner contrary to his best judgment or resign his position ;—

Resolved, That in the opinion of the members of the American Society of Civil Engineers, who vote affirmatively upon this resolution, it is unprofessional for a civil engineer to continue the discharge of his duties when so restrained or overruled ; or to accept an engagement which it is generally known has been vacated because of such interference by employers, until the judgment of his predecessor has been formally disapproved by other disinterested civil engineers, competent to decide and familiar with the facts of the case.

The following was offered as a substitute for the same by William J. McAlpine :

Whereas, A Civil Engineer, in the practice of his profession, is sometimes restrained or overruled by his employers in matters involving serious risk to property and life ;—

Resolved, If such engineer shall see fit, he may ask for the appointment of a committee of the Members of the Society to examine the questions at issue, and if such committee shall advise in his favor, then and after proper representations to his employers, it is the opinion of those who vote in the affirmative, that it is his duty to resign his position. It is also the opinion of those who so vote, that it would be unprofessional for any member of the Society to accept the place so vacated, unless such member disagrees in opinion upon some material point involved in the controversy.

The Society then adjourned.

OF THE BOARD OF DIRECTION.

OCTOBER 4TH, 1877. — The Board met and adjourned without action.

OCTOBER 9TH, 1877.—The Board met and received report in reference to unpaid dues. A report was also received in reference to arranging the names of members in order of their seniority.

OCTOBER 11TH, 1877.—The Board met, received report of the Committee on Nominations for Officers of the Society, and directed the issue of ballots in accordance with the By-Laws.

NOVEMBER 1ST, 1877.—The Board met and considered draft of Annual Report. The following regulations governing the ballot for officers at the annual meeting were adopted :

It shall be the duty of the Secretary to prepare before the annual meeting an alphabetical list of the members of the Society who are entitled to vote for officers. Three tellers shall be appointed by the President at the annual meeting, who shall count the number of ballots

received by mail, examine the endorsements upon the ballots, make a mark opposite the name of each voter on the list, and remove the outer envelope. The President shall then request such members present as have not voted to deposit their ballots, and the tellers shall mark on the list the name of each person so voting. When all have had an opportunity to vote, the tellers shall proceed to open and count the ballots, and shall declare the result to the President, who shall announce it to the meeting. In case a second ballot shall be found necessary, the names of those voting shall be marked as before. The names of the members voting on the first ballot shall be published in the November issue of the Proceedings of the Society.

It shall be the duty of the Secretary to keep a book containing a list of the voting members of the Society, with columns ruled in such a manner as to enable the name of each voter on every letter ballot to be noted.

NOVEMBER 5TH, 1877.—The Board met, considered and perfected the draft of its Annual Report.

NOVEMBER 7TH, 1877.—The Board met and received a statement from the Centennial Commission of the Society in reference to memoirs upon special engineering topics prepared under its auspices. It was resolved that these memoirs be referred to the Committee on Library.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Architecture, a Handbook of Architectural Styles. Trans. from the German of A. Rosengarten by W. Collett Sanders. New ed. London. Crown 8vo, illus. Chatto & Windus. 7s. 6d.

Astronomy. By J. Rambossion, Laureate of the Institute of France. Trans. by C. B. Pitman. New ed. London. Crown 8vo. Chatto & Windus. 7s. 6d.

Traite d'Astronomie et de Meteorologie appliquees a la Navigation, Tome Premier, Astronomie. Par G. Chabirand. 8vo, paper. Paris, 1877. Van Nostrand. \$4.00.

By R. S. Ball, Royal Astronomer of Ireland. London Science Class Books. London. 8vo, illus. Longmans. (Announcement.) 1s. 6d.

Bricklaying. The rudiments of practical —. Adam Hammond. 2d ed. Weales Series. London. Lockwood, Crosby & Co. 1s. 6d.

Bricks and Tiles. Rudimentary Treatise on the manufacture of —. Edward Dobson. With Additions by C. Tomlinson. New ed. Weales Series. London. Illus. Lockwood, Crosby & Co. 3s.

Chemistry, A primer of—, including Analysis. Arthur Vacher. Philadelphia. 16mo. Lindsay & Blakiston. (Announcement.) \$0.50.

A Manual of Inorganic. Vol. 1. The Non-Metals. New ed. With Copious Index and Examination Questions and Exercises. (Collins' Advanced Science Series.) T. E. Thorpe. London. 12mo. Collins. 3s.

Miller's Elements of—, Part I. Chemical Physics. 6th ed., rev., with Additions by H. McLeod, Professor of Experimental Science, Royal Engineering College. London. 8vo, illus. Longmans. 16s.

Conic Sections. The method of Projections. S. B. Kincaid. London. 8vo. Stanford. 2s. 6d.

Cornwall. Observations on the rich parts of the lodes of—. Their Form and their Relations with the Directions of the Stratigraphic Systems. L. Moissenet. Trans. by J. H. Collins. London. Simpkins. 7s. 6d.

Diatoms. Practical directions for collecting, preparing and mounting—. A. M. Edwards. New York. 12mo. Indust. Pub. Co. \$0.75.

- Drainage, the — of Lake Fucino, by Prince A. Toriteia. Historical and technical account, by A. Brisse and L. de Rotrou. Trans. by V. de Tivoli. London. 4to. and folio Atlas, illus. *Dulau & Co.* £2.10s.
- Engineering, Dictionary of —. A Supplement to *Spons* —. In about 36 numbers. New York. *Spons*. (Announcement.)
- Engineers. The Young —. What They Did and How They Did It. London. 16mo, illus. *Trübner & Co.* (Announcement.)
- Engines and Boilers. Pocket book of practical rules for the proportions of Modern — for land or marine purposes. 6th ed. London. 32mo. *Spons*. 4s. 6d.
- Encyclopædia, Chambers' New ed. 10 Vols. London and Edinburgh. *Chambers*. 8vo. £4.15s.
- Exact Sciences. The First Principles of the —. Explained to the Non-Mathematical. W. Kingdon Clifford. London. *C. K. Paul & Co.* (Announcement.)
- Gas Consumer's Handbook. By W. Richards. London. *Spons*. (Announcement.)
- Geology of New Hampshire. By Prof. C. H. Hitchcock. Vol. 3 and Atlas. Concord, N. H. *E. C. Eastman*. (Announcement.)
- The Physical Geology and Geography of Great Britain. By Prof. A. C. Ramsay, Director General of the Geological Surveys of the United Kingdom. 5th ed., enl. London. Post 8vo., with Geological Map printed in Colors, and numerous Illustrations. *Stanford*. (Announcement.)
- The Physical Geology and Geography of Ireland. By Edward Hull, Director of the Geological Survey of Ireland; Author of "The Coal Field of Great Britain." London. Post 8vo., with Maps and Illustrations. *Stanford*. (Announcement.)
- Geometry. The — of Compasses; or, Problems resolved by the mere Description of Circles, and the use of Colored Diagrams and Symbols. Oliver Byrne. London. 8vo. *Lockwood*. 3s. 6d.
- , descriptive. Elements of —, shadows and perspective. S. Edward Warren. New York. Small 8vo. Plates. *Wiley & Sons*. \$3.50.
- Health, Public. Reports and papers presented at the Meetings of the Amer. Public Health Assoc., 1875-6. Vol. 3. New York. 8vo. *Hurd & Houghton*. \$4.00.
- Preventive Medicine in relation to the Public Health. Being Lectures and Addresses delivered at St. Thomas's Hospital and elsewhere. Revised by the Author. Alfred Carpenter. London. 8vo. *Stapkin*. 6s.
- Hospitals: Their History, Organization and Construction. W. Gill Wylie. New York. 8vo. *Appletons*. \$2.50.
- Hydraulic presses and other Hydraulic machinery; Notes for users of —. Compiled by E. Howard. London. *Hayward, Tyler & Co., Upper Whitecross St.* 2s. 6d.
- Inlaid and Sorrento Work. A complete Manual of —: Scroll sawing, Silhouettes and House Ornamentation. Arthur Hope. 3d ed. Chicago. 8vo, illus. *John Wilkinson*. Cloth, \$1.25. Paper, \$0.50.
- Iron and Steel. The prehistoric use of —. St. John V. Day. London. 8vo. *Trübner*. 12s.
- Machine design, the elements of —; an introduction to the principles which determine the arrangements and proportions of the parts of machines, and a collection of rules for machine designs. W. Cathorne Unwin. New York. 12mo. *Appletons*. \$1.50.
- Machinery, Illustrated Handbook of —. C. J. Appleby. London. *Spons*. Section 1, Prime Movers. 3d ed. 8vo. 2s. Section 2, Hoisting and Machinery. 3d ed. 8vo. 3s. 6d.
- Markets. Designs for the Construction of —, Warehouses and Sheds. A. Friedmann. Trans. by E. H. d'Avigder. London. Folio, illus. *Spons*. 42s.
- Mathematical Exercises. With Tables, Formulae, Answers, and References. S. H. Winter. New ed. London. 12mo. *Longmans*. 6s. 6d.
- Mathematical Instruments. Comprising Drawing, Measuring, Optical, Surveying, and Astronomical Instruments. J. F. Heaber. Enl. ed., with illus. *Weales Series*. London. *Lockwood, Crosby & Co.* 4s. 6d.
- Mathematical Tables and Logarithms. Charles Hutton. New ed. London. Royal 8vo. *Whittaker*. 12s.
- Mechanics. The practical Dictionary of —. Containing 15,000 Drawings of Machinery, Instruments, and Tools in Use by every Profession and Trade, with Comprehensive and Technical Description of every subject. Complete in 3 vols. London. Super royal 8vo. *Cassell, Pelter & Galpin*. £3 3s.
- Military Examinations. Examination Papers set at the Open Competitions for Admission to the Royal Military Academy, Woolwich, and the Royal Military College, held under the Direction of the Civil Service Commissioners, in July, 1877; together with Regulations and Tables of Marks. London. 8vo. *British Government Publications*. 1s. 6d.
- Mill Gearing; practical Treatise on —, &c., for Engineers. T. Box. London. Post 8vo. *Spons*. 7s. 6d.
- Minerals, Tables for the Determination of —, by those physical Properties ascertainable by the aid of such simple instruments as every student in the field should have with him. Based on the Tables of Weisbach. By Persifor Frazer, Jr. New and revised edition. Philadelphia. 12mo. *Lippincott*. \$2.00.
- Mineral Surveyor and Valuer's Complete Guide. By William Lintern, Mining and Civil Engineer. With four plates of Diagrams, Plans, &c. *Weales Series*. London. *Lockwood Crosby & Co.* (Announcement.)
- Mining; a descriptive Treatise on Mining, Machinery, Tools, and other Appliances used in Mining. George Q. Andre. Vol. 1. London. 4to. *Spons*. 26s.
- Perspective, Elementary —. Explained and Applied to Familiar Objects. For the Use of Schools and Beginners in the Art of Drawing. By M. J. Keller, School of Design, University of Cincinnati. Cincinnati. 12mo. *Robert Clarke & Co.* (Announcement.) \$0.75.
- Photography; History and Handbook of —. Translated from the French of Gaston Tissandier. Edited by J. Thomson. Woodcuts and Specimens of Prints by the best permanent Processes. Second and revised edition, with Appendix by Henry Fox Talbot, giving Account of his Researches.

- London. Imp. 16mo, illus. *Low, Sampson & Co.* (Announcement.) 6s.
- Portland Cement; practical Treatise on the Manufacture of —. Henry Reid. New York. *Spons.* (Announcement.)
- Pyramid; a Miracle in Stone, or the Great — of Egypt. Joseph H. Seiss. Philadelphia. 12mo. *Porter & Coates.* \$1.25.
- Railway Revenue, and its Collection. Containing Rules and Regulations necessary to insure faithful accounting, and explaining generally the object and extent of railway accounts, and the necessity of their being organized upon Scientific Principles. Marshall M. Kirkman. New York. 12mo. *Railroad Gazette.* \$2.50.
- Resistance of Materials; a Treatise on — and an Appendix on the Preservation of Timber. De Volson Wood. 3d ed., revised. New York. 8vo, illus. *Wiley & Sons.* \$3.00.
- Roeks; a Guide to the Determination of —; being an Introduction to Lithology. Edward Jannettaz. Translated by George W. Plimpton. 12mo, illus. *Van Nostrand.* \$2.00.
- Steam Engineering; a new Treatise on —; physical Properties of permanent Gases and of different kinds of Vapor. John W. Nystrom. New ed. New York. *G. P. Putnam's Sons.* \$2.50.
- Steam; Elementary Treatise on — and the Use of the Indicator. J. C. Graham. New York. *Spons.* (Announcement.)
- Telephone, The; an Account of the Phenomena of Electricity, Magnetism; and Sound, as involved in its action; with Directions for making a Speaking Telephone. Prof. A. B. Dolbear, of Tufts College. Boston. 16mo, illus. *Lee & Shepard.* \$0.75.
- Textile Fabrics. Ornamental — of all Ages and Nations. A practical Collection of Specimens. 50 Plates, in gold and silver colors, comprising upward of 1,000 various styles of Ancient, Mediæval, and Modern Ornamental Designs of Textile Fabrics; with Explanatory Descriptions and a general introduction. Dupont & Auberville. 1 vol., folio, cloth gilt, extra. *Van Nostrand.* \$40.00.
- Thermo-dynamics. R. Wormell, Head Master of the City of London Middle-class Schools. London. Fcap 8vo, illus. *Longmans.* (Announcement.) 1s. 6d.
- Topographies, Country —. Edited by E. R. Kelly, M. A., Wiltshire; with Map engraved expressly for the work. London. 8vo. *Kelly.* 5s.
- Tramways. Report from the Select Committee on Tramways (use of mechanical power); together with the Proceedings of the Committee, Minutes of Evidence, &c. Folio paper. London, 1877. *Van Nostrand.* \$1.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

- From Julius W. Adams, Brooklyn: Report of Referees and their opinion in case of W. C. Kingsley and A. C. Keeney, against the City of Brooklyn. In City Court of Brooklyn, Aug. 4, 1877.
- From A. Anderson, Chicago: Report of Receiver, case of Fosdick and Fish against the Chicago, Danville & Vincennes R. R. Co. In Chancery. U. S. Circuit Court, Northern District of Illinois. A. Anderson. Chicago. 1877.
- From Blake Crusher Company, New York: Prize Essay on Roads and Road-making. Clemens Herschel. New York. 1877. (Several copies.)
- From Boston Public Library: Bulletin No. 43. October, 1877. Boston Public Library. Boston.
- From Geo. H. Forster, New York: Testimony taken before the Canal Investigating Committee at the Capital. State of New York. Reported Photographically. New York. 1875.
- From Schuyler Hamilton, New York: Our National Flag, the Stars and Stripes, its History in a Century. Schuyler Hamilton. New York. 1877. (Several copies.)
- From Institution of Engineers and Shipbuilders in Scotland: Transactions of the Institution. Vol. XX. Twentieth Session, 1876-7. Edited by the Secretary. Glasgow. 1877.
- From W. H. McFadden, Philadelphia: Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for the year 1876. W. H. McFadden. Philadelphia. 1877.
- From E. Pontzen, Vienna: Report on Centennial Exhibition at Philadelphia. Published by the Austrian Commission. Part 13. The Railroads in the United States, with particular regard to the Depots, the mechanical construction of the Coaches and the course of railways through cities. Ernest Pontzen. Vienna. 1877. (German.)
- From Francis Rziha, Vienna: Report on Centennial Exhibition at Philadelphia. Group 18, Section 2. Underground and Elevated Railways. Part III. Elevated Railways. Francis Rziha. Vienna, 1877. (German.)
- From J. D. Van Buren, Jr., Albany: Annual Report of the State Engineer and Surveyor of the State of New York, and of the Tabulations and Reductions from the Report of railroad corporations for the year ending Sept. 30, 1876. J. D. Van Buren, Jr. Albany. 1877.
- From D. Van Nostrand, New York: Van Nostrand's Science Series. No. 31. The sanitary condition of City and Country Dwelling Houses. George E. Waring, Jr. New York. 1877.
- Van Nostrand's Science Series. No. 32. Cable Making for Suspension Bridges with special reference to the Cables of the East River Bridge. W. Hildenbrand. New York. 1877.
- From John Whitelaw, Cleveland: Twenty-first Annual Report of the Board of Trustees of Water Works to City Council of Cleveland, with Reports of the Officers of the Board for 1876. Cleveland. 1877. (2 copies.)

American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, November, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

ANNUAL MEETING, NOVEMBER 7TH, 1877.—The twenty-fifth annual meeting was called to order at 10½ A. M., President George S. Greene in the chair. The following members were present during the session :

Messrs. Adams, Aldrich, Avery, John W. Bacon, J. G. Barnard, Baxter, Beardsley, L. F. Beckwith, Bissell, Bogart, Brush, T. C. Clarke, Chanute, Chittenden, Collingwood, Compton, Cooper, Coryell, Croes, H. Crosby, W. Crosby, T. G. Ellis, Emery, Endicott, Forney, Godwin, G. S. Greene, R. L. Harris, Haswell, Hering, Holley, Hutton, Kingsley, Leverich, T. J. Long, Macdonald, C. L. McAlpine, W. J. McAlpine, Morison, J. O. Morse, O. F. Nichols, North, Owen, W. H. Paine, Prout, A. J. Post, Roberts, Schott, Schnyler, Searles, Sedgwick, Shinn, Spielman, Striedinger, Thurston, Van Winkle, Walling, C. D. Ward, L. B. Ward, D. V. Wood, Worthen and Yardley.

The Secretary, Mr. Leverich, presented and read the Annual Report of the Board of Direction,* which was accepted.

The President stated that, under the perfected organization of the Society, as referred to in the Report of the Board of Direction, the law of the State required the appointment of Trustees for one year. In order to avoid any confusion, and to have the term of office expire with

* See page 113.

the Society year, the officers acting as Trustees had resigned such office, to take effect this day.

The Secretary read the resignation as follows :

We hereby resign our office as Trustees of the American Society of Civil Engineers, as appointed under Act of Incorporation, filed in the office of the County Clerk of the City and County of New York, April 17th, 1877, such resignation to take effect on the first Wednesday of November, 1877.

GEORGE S. GREENE,

A. L. HOLLEY,

THEO. G. ELLIS,

G. LEVERICH,

JOHN BOGART,

W. H. PAINE,

JAMES O. MORSE,

M. N. FORNEY,

W. MILNOR ROBERTS,

J. JAMES R. CROES.

Mr. Shinn offered the following resolution :

Resolved, That the resignation of the officers of the Society as Trustees of the Society, under the act of the Legislature of April 12th, 1848, this day presented, be, and the same is hereby accepted, to take effect when their successors are elected.

Resolved, That the officers this day elected shall be the Trustees of the Society for the balance of the term of their predecessors, whose resignation is this day accepted, and until their successors shall be duly elected under Article 5 of the Constitution of the Society.

After discussion the resolution was passed.

The President then presented the report of the Board of Censors to award the Norman Medal.* This medal was thereby awarded to Mr. W. W. Maclay, he being the author of a paper entitled "Notes and Experiments on the use and testing of Portland Cement." Books to the value of the medal were awarded to Mr. Julius H. Striedinger, he being the author of a paper entitled "On igniting blasts by means of Electricity."

The Treasurer's Annual Report was then read,† and referred to the Finance Committee.

The Treasurer, Mr. John Bogart, also stated that the Society had been unable, for a number of years, to obtain interest on certain stock of the New York Central Railroad belonging to the Society, owing to the loss, many years ago, of the certificate. There were delays in taking legal steps to recover this stock, on account of the expressed intention of the railroad company to contest a suit and to carry the case to the Court of Appeals. The former Treasurer of the Society, Mr. James O. Morse, deemed it injudicious to involve the Society in such a suit. Similar cases have, however, since been decided, and legal proceedings are now pending to recover the stock. A bond must be given to secure the company against loss by the possible presentation of the original certificate by other parties.

* See page 124. † See page 126.

The following tellers were appointed :—For counting the ballots for election of officers, C. Ridgley Schott, William R. Hutton and Robert L. Harris.

For counting the ballots for admission of new members, Wilson Crosby and Charles B. Brush.

Mr. W. Milnor Roberts, chairman, presented the report of the Committee on Finance,* which was accepted.

The Secretary presented the report of the committee on time and place of the next Annual Convention.†

Letters were read in reference to this subject from Messrs. Frederick Brooks and Joseph P. Davis, members of this Society, and from Mr. C. Frank Allen, member of the Boston Society of Civil Engineers.

Mr. W. P. Shinn moved that the next Convention of the Society be held in Boston.

Mr. Robert L. Harris moved to amend by substituting San Francisco.

After discussion the amendment was lost, and the original motion, naming Boston, was carried.

The decision of the time for holding the Convention was referred to the Board of Direction.

Mr. T. G. Ellis, chairman of the Centennial Commission of the Society, verbally reported progress, and stated that sub-committees of the Commission were engaged in the preparation of memoirs which would be presented to the Society. No formal action in reference to the Paris Exposition had yet been taken by the full commission. Its members now present, however, had agreed to assume the editing of reports that might be sent from Paris, but no provision had been made either for representation there or the preparation of special memoirs. The Commission asked to be continued. On motion, it was so ordered.

The report of the Committee on Gauging of Streams was presented by the chairman, Mr. J. J. R. Croes,‡ and read. On motion, the report was received and the committee continued.

The report of the Committee on Metric System of Weights and Measures was then presented and read.§

Mr. Croes moved that the Committee be continued, which was lost.

After discussion, Mr. T. G. Ellis moved that the further consideration of the Metric System of Weights and Measures be indefinitely postponed and that this question be submitted to letter ballot, which was carried.

Mr. W. P. Shinn, Chairman of the Committee on Resistances of Railway Trains reported verbally that since the last annual meeting, Mr. Dudley, whose operations with the Dynograph were to be the basis of investigations, had been continuously employed by the Eastern Railway Association in reference to patent suits which are pending.

It had been determined upon by the Committee to request the leading railway companies to unite in the employment of Mr. Dudley, un-

* See page 125. † See page 124. ‡ See page 123. § See page 124.

der the direction of the Committee, to make a certain range of experiments in regard to economical features of railway transportation.

Some progress has been made, but the present engagement of Mr. Dudley has been much more prolonged than was anticipated and may continue several months. The information already obtained by him cannot be made public until used in the pending suits. The Committee submits the question of its continuance to the Society.

On motion the Committee is continued.

A reconsideration of the vote discontinuing the Committee on Metric System of Weights and Measures was moved. Decided by the Chair to be out of order, and, on appeal, the decision of the Chair was sustained.

Mr. W. P. Shinn, Chairman of Committee on Uniform Accounts and Returns of Railway Companies presented its report* which was read and accepted and the Committee continued.

The Report of the Committee on Tests of American Iron and Steel† W. Sooy Smith, Chairman, was presented and read.

Mr. Thurston gave an account of what had been done since the date of the statement referred to in the report. He stated that Congress, having done nothing, the work of the Board in its general form stands now, just as it then did. The committees are finishing the details necessary to make their reports. The Committee on Chemical Research has had a large number of specimens, particularly of steel, analyzed. The analyses are made with an unusual degree of accuracy, and the result is a quantitative determination of the elements which enter into the composition of the specimens in such minute quantities that chemists do not usually regard them. It is hoped to determine by these analyses what the exact influence is of each of these elements. Altogether, about one thousand samples of steel have been forwarded to be made into test pieces. About one-sixth have been tested, the remainder will be as soon as Congress furnishes funds.

The Committee on Wrought Iron and Rails has made some four or five hundred pages of manuscript reports. The Committee on Beams and Girders has been making experiments at Buffalo and a report is in preparation. The Committee on Tool Steels has continued the work heretofore indicated. The Committee on Metallic Alloys has prepared a report of 650 pages of manuscript, with a large collection of plates and tables of results. The report of the Committee on Composite Alloys is also ready. Several other reports are also in preparation and experimental work will proceed if funds are provided for it.

The testing machine is not yet set up and will not be till there is money to do it.

The work of the committees is in such shape that individual members who have taken charge of it can complete their special work if the Board expires as a Board. The immense amount of work that has been done

* See page 123. † See page 123.

will not be lost, but a change of method or the attempt to secure funds by private subscription would involve great toil. The report of the Board will be made to the President next month and will be published as a public document. The expense incurred for the machine, except for setting it up, is provided for, and that, also, can be provided if there is any prospect of its being used. The principal parts of the machine are at Chicopee, the other parts at Watertown.

Amendments to the Constitution were then considered and fully discussed, and it was ordered, by a vote in each case, that the recommendations stated below for each amendment should be transmitted to the Society, with the ballot list.

It was recommended that the following amendment should be adopted :

ARTICLE XIX.—For “two” insert “five,” and for “thirty” insert “twenty-five.” The article will then read :

All candidates for admission to the Society must file statements, by themselves, setting forth the grounds of their claim to be elected ; be proposed by at least *five* members of the Society, to whom they must be personally known, and a notification of the same sent to each member whose address is on record. Each proposition, with the names of the proposers, must be posted in some conspicuous place in the rooms of the Society for at least *twenty-five* days before being submitted to vote. All papers and applications shall be laid before the Board of Direction, and be reported upon, previous to action by the Society.

It was recommended that the following amendment should not be adopted :

ARTICLE XX.—For “thirty” insert “twenty-five,” and for last clause insert as below. The article will then read :

In elections for membership, of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after *twenty-five* days have elapsed from the time of mailing the notification. Negative ballots exceeding *five* per cent. of the total number canvassed shall exclude.

It was recommended that the following amendment should be adopted :

ARTICLE XX.—In elections for membership of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after thirty days have elapsed from the time of mailing the notification. *Five* or more ballots cast in the negative shall exclude. Members notified, but not responding, shall be classed as voting in the affirmative.

It was recommended that the following amendment should not be adopted :

ARTICLE XX.—For “three” insert “ten;” the article otherwise will read as the preceding.

It was recommended that the following amendment should not be adopted :

ARTICLE ——. (A new article):—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who from ill health, advanced age, or other good reason assigned, has a scanty income ; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof desirable additions to the Library and Museum.

It was recommended that the following amendment should not be adopted :

ARTICLE —. (A new article):—Upon the written request of ten or more members that, for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and, if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, may then expel the accused. Such action shall be stated to him and the Society, and this shall be in any event the only public announcement of the matter.

It was recommended that the following amendment should be adopted :

ARTICLE —. (A new article):—Upon the written request of ten or more members, that for cause therein set forth a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member, and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall in any event, be the only public announcement of the matter.

It was recommended that the following amendment should be adopted :

ARTICLE XXII.—Persons thus elected and duly qualified, who reside within fifty miles of the post-office in the City of New York, shall be deemed resident; and those who reside beyond this limit shall be deemed non-resident. The membership of any person shall begin on the day of his election.

It was recommended that the following amendment should be adopted :

ARTICLE XXIX. (To read):—Members who become residents or non-residents by removal into or beyond the limits prescribed in Article XXII, shall be subject to assessments in the class in which they were on the day of the annual meeting, as may appear upon the records of the Society or by written notice to the Secretary.

It was recommended that the following amendment be adopted :

ARTICLE —. (A new article):—Members in arrears for more than one year's annual dues shall not be allowed to vote until such dues are paid.

Amendments to the By-Laws were then considered. After discussion the following proposed amendments were referred to the Board of Direction :

SECTION 20. *First.*—The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction ; he shall draw all checks, which shall be signed by him and the President or Chairman of the Committee on Finance and countersigned by the Secretary.

SECTION 20. *Second.*—The Treasurer, before he shall enter upon his duties, shall give a bond for the faithful discharge thereof to the amount of \$5,000, with sureties therefor who shall be approved by the Committee on Finance. All moneys which he may receive shall be immediately deposited to the credit of the Society, in such bank as the Committee on Finance shall direct.

None of the moneys, securities or other property of the Society shall be paid out or incumbered, except for the payments of bills and accounts which have been duly examined and approved by the Committee on Finance, and no moneys shall be withdrawn except for such duly approved bills and accounts drawn by the Secretary and approved by the Committee on Finance in favor of the person to whom such moneys are due.

The following amendment was adopted :

SECTION —. (A new section): In all cases where the By-Laws or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior Resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

The following amendment was adopted :

SECTION 33. (To read):—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast shall be necessary for the adoption of any such addition or amendment.

The resolutions offered October 3d, 1877,* and October 18th, 1877,† in reference to the duties of the Secretary, were referred to the Board of Direction.

The resolutions offered October 18th, 1877,‡ in reference to duties of Engineers under certain specified circumstances, were referred to the Board of Direction.

The following resolution was offered by Mr. Walling, and was passed :

Resolved, That it is inexpedient for this Society to instruct its members as to their duties in private professional matters.

The tellers of the vote for election of members made their report, and the following candidates were declared elected : Members—Charles O. Brown, of New York (became Junior, February 16th, 1875) ; and Frederick W. Clarke, of Chicago. Junior—Charles W. Raymond, of New York.

The report of the Committee on Nomenclature and Classification of Masonry,§ was presented by the Chairman, Mr. J. J. R. Croes.

The report of the Committee on Quarters for the Society,|| was presented by the Chairman, Mr. Bogart.

On motion, the committee was continued.

Mr. Walling presented a form of memorial to Congress in reference to extending the triangulations of the United States coast survey.¶

On motion, it was directed that the memorial should be submitted to the Society by letter ballot.

Mr. Collingwood offered the following amendment to the Constitution, which was seconded :

ARTICLE — (A new Article). The Board of Directors may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, or who, from ill

* See Proceedings, page 90. † See Proceedings, page 100. ‡ See Proceedings, pages 100 and 101. § See page 122. || See page 125. ¶ See page 127.

health, advanced age, or any other good reason assigned, is unable to pay such dues : and the Board may remit the whole or part of assessments in arrears, or accept, in lieu thereof, desirable additions to the Library or Museum.

The following amendment to Section 30 of the By-Laws, offered by Mr. Herschel, was presented and seconded :

SECTION 30.—(To read).—Special committees, to report on engineering subjects, shall be authorized only by a majority of the votes cast by the Society, and in the following manner : Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument against the appointment of such committee. The mover of the resolution under consideration shall be invited to present the arguments for the same under a limit of occupying no more than one-half page of the printed proceeding in their presentation ; the same limit to obtain also in the case of the arguments against. Said invitation shall be extended to the mover at least one month before the argument is needed to go upon the letter ballot ; and if not furnished by that time, no argument for the resolution shall be presented. The statements of argument shall be printed and issued to the Society with letter ballot ; or, if the Board fails to report within one month, the letter ballot shall be issued without comment ; or the Society may vote by ballot at the Annual Meeting or in Annual Convention upon such resolution, within one month after it has been submitted to the Board of Direction. No mover of a resolution shall serve in the presentation of arguments *against* a resolution under this By-Law while the resolution offered by him is pending a vote of the Society.

The tellers to canvass the vote for officers of the Society presented their report, and the following were declared elected : E. S. Chesbrough, President ; W. Milnor Roberts and Albert Fink, Vice-Presidents ; J. James R. Croes, Treasurer ; William H. Paine, Joseph P. Davis, George S. Greene, C. Shaler Smith, and C. Vandervoort Smith, Directors.

No person having received a majority of all the votes cast for the offices of Secretary and Librarian, a ballot was then taken. The tellers to canvass the vote made their report, and John Bogart was declared elected Secretary and Librarian.

The thanks of the meeting were presented to the canvassers of the votes for members and for officers.

It was moved, seconded, and unanimously carried, that the thanks of this Society be presented to Mr. G. Leverich, the retiring Secretary, who has for so many years discharged the duties of that office.

Adjourned.

THE
ANNUAL REPORT OF THE BOARD OF DIRECTION,
FOR YEAR 1876-7.

PRESENTED NOVEMBER 7TH, 1877.

The Board of Direction, in compliance with Article XII of the Constitution, herewith presents a "Report on the affairs of the Society, embracing the Report of the Treasurer" for the term from November 1st, 1876, to November 6th, 1877:

On November 1st, 1876, the membership was:—

Honorary Members, resident.....	2	Non-resident.....	4	Total	6
Corresponding "	"	3	"	3
Members, resident	113	"	304	" ..	417
Associates, "	5	"	11	" ..	16
Juniors, "	7	"	44	" ..	51
Making "	127	"	366	—	484
Fellows, 70—of whom 10 are Members and 1 Honorary Member, leaving.....					59
Total then connected with the Society.....					552

To-day the membership is:—

Honorary Members, resident.....	2	Non-resident.....	4	Total	6
Corresponding "	"	3	"	3
Members, resident	110	"	326	" ..	436
Associates, "	4	"	12	" ..	16
Juniors, "	9	"	47	" ..	56
Making "	125	"	392	—	508
Fellows, 68—of whom 10 are Members and 1 Honorary Member, leaving.....					57
Total now connected with the Society.....					574

On November 1st, 1876, the number of proposals for admission to the Society, then pending was 6; the number during the year past was 43; of this number 27 were elected as Members (of whom 2 were transferred from Associates), 2 as Associates and 5 as Juniors; 5 were laid on the table or withdrawn and 8 are pending.

7 Members and 1 Fellow elected before November 1st, 1876, and 24 Members, 2 Associates and 5 Juniors, elected since, have qualified.

The increase during the Society year has been:—

Members, admitted, 31—less resigned, 4—died, 7.....		20
Associates, " 2 " transferred, 2.....		
Juniors, " 5 " resigned, 1.....	4—	24
Fellows, " 1 " died, 3, decrease.....		2
Total " 39, less transfered, 2—resigned, 5—died, 10.....		22

18 meetings of the Society were held during the year, one of which was the Ninth Annual Convention ; 9 were regular and 2 adjourned meetings, at which ballots for members were canvassed and other business done, and 6 were "stated" meetings, when papers were read and discussions had upon engineering subjects, and generally time given for discussion.

20 stated and special meetings of the Board were held during the year, generally for examination into the qualifications of candidates for membership, the application of the Society's funds, and similar general business of the Association.

The Ninth Annual Convention was held in New Orleans, April 24th and 25th, followed by visits to interesting points in the city, and excursions to the jetties at the mouth of the Mississippi and to the Bonet Carré Crevasse.

Members of the Boston Society of Civil Engineers, of the Civil Engineers' Club of the Northwest, of the Civil Engineers' Society of St. Louis, and of this Society, were in attendance.

Full reports of the proceedings have been published in "Transactions."

Papers were presented to the Society, during the year, as follows :

- Notes on the Masonry of the East River Bridge. Francis Collingwood.
- On the Rate of Set and Decrease of Resistance of Metals subject to distortion. Robert H. Thurston.
- Levees, Discussion (incomplete). George W. R. Bayley.
- Co-ordinate Surveying. Henry F. Walling.
- Failure of the Ashtabula Bridge. Charles Macdonald.
- The Simultaneous Ignition of Thousands of Mines, and the most advantageous Grouping of Fuses. J. H. Striedinger.
- American Society of Civil Engineers and its Future. W. Milnor Roberts.
- Wing Dams in the Mississippi, above the Falls of St. Anthony. Edward P. North.
- Cushioning the reciprocating Parts of Steam Engines. John W. Hill.
- Description of a Design for a Steam Vacuum Pump. William H. Lotz.
- Description of recent Tests of the New Iron Bridge over the Kentucky River, on line of the Cincinnati Southern Railway. L. G. F. Bouscaren.
- Details of Methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf. E. L. Corthell.
- Flow of Water in open Channels. Theo. G. Ellis.
- Improvement of Entrance to Galveston Harbor. Charles W. Howell.
- Novel Railway Survey. Thomas S. Hardee.
- Patents and Patent Laws, Inventions, Inventors and Authors. C. G. Forshey.
- Relative Quantities of Material in Bridges of different Kinds, and of Various Heights. Charles E. Emery.
- Results of recent Test Levels on the Line of the Erie Canal. William H. Searies.
- Consideration of the Impact of a Falling Body. Charles H. Haswell.
- On a New Type of Steam Engine, theoretically capable of Utilizing the full mechanical Equivalents of Heat Energy, and on some Points in Theory, indicating its Practicability. Robert H. Thurston.

Reports were made to the Society, during the same time, as follows :

Annual Report of the Board of Direction on the affairs of the Society, for year ending October 31st, 1877.

Award of the Norman Medal. George S. Greene, Chairman.
 Time and Place of the Ninth Annual Convention. G. Leverich, Chairman.
 Tests of American Iron and Steel (2 reports). W. Sooy Smith, Chairman.
 Gauging of Streams. J. J. R. Croes, Chairman.
 Resistances of Railway Trains. William P. Shinn, Chairman.
 Uniform Accounts and Returns of Railroad Companies. William P. Shinn, Chairman.
 Centennial Commission of the Society. Theodore G. Ellis, Chairman.
 Centennial Commission of the Society, Committee on Finance (2 reports). W. Milnor Roberts, Chairman.
 Committee on Finance, on Report of the Treasurer. W. Milnor Roberts, Chairman.
 Metric System of Weights and Measures. Clemens Herschel, Chairman.
 Quarters for the Society. John Bogart, Chairman.

Discussions were had on many of these papers and reports, when read before the Society ; also on the following subjects :

Levees, as a System of Reclaiming Low Lands.
 Preservation of Timber.
 Eye-Bars.
 Connected-Arc Marine Boilers.
 Mount Washington Railway, its Construction and Operation.
 Cut-offs of the Mississippi River, their Effect on the Channels above and below.
 Efficiency of Steam Vacuum Pumps.

Many of these papers, reports and discussions have been published in Transactions and Proceedings during the year, also these papers presented last year :

A Cheap Transfer Table. William P. Shinn.
 Principles of Tidal Harbor Improvements, as applied at Wilmington, Cal. Clinton B. Sears.
 Reconstruction and Enlargement of Cork Run Tunnel, on the Pittsburg, Cincinnati & St. Louis Railway. M. J. Baker.
 Memoir of American Engineering. John B. Jervis.
 Discussion on the Croton Water Works, and Supply for the Future. J. J. R. Croes.
 A Water Conduit under Pressure. John T. Fanning.
 Consumption and Waste of Water delivered by Public Works. J. H. Harlow.

Referring to the lists of papers presented to the Society, which were unpublished at the date of last report of the Board ; of these, the following were published during the past year :

Efficiency of Steam Vacuum Pumps. J. Foster Flagg.
 Approximate Determination of Stresses in the Eye-Bar Head, William H. Burr.

The following presented, and not published during the year, are to be added to the list :

Levees, a Discussion. George W. R. Bayley.
 American Society of Civil Engineers and its Future. W. Milnor Roberts.
 Cushioning the Reciprocating Parts of Steam Engines. John W. Hill.
 Description of a Design for a Steam Vacuum Pump. William H. Lotz.
 Description of recent Tests of the new Iron Bridge over the Kentucky River, on Line of the Cincinnati Southern Railway. L. G. F. Bouscaren.
 Details of methods of Determining the Slope of the Mississippi River, from New Orleans to the Gulf. E. L. Corthell.
 Patents and Patent Laws, Inventions, Inventors and Authors. Caleb G. Forshey.
 Results of recent Test Levels on the Line of the Erie Canal. William H. Searles.
 Consideration of the Impact of a falling Body. Charles A. Haswell.
 On a new Type of Steam Engine, theoretically capable of utilizing the full mechanical Equivalents of Heat Energy, and on some Points in Theory, indicating its Practicability. Robert H. Thurston.

In addition to these, are several reports of Committees, upon a number of subjects, which are still unpublished.

Some papers which were presented to the Society during the year, appeared to the Committee on Library to fall under the clause of the 16th By-law, which precludes from publication certain matter, and the Committee declined to publish them. The question at issue appears to be an important one, as affecting the standard of the publications of the Society. The Board of Direction are not unanimous in sentiment on the subject.

The ground taken by the Committee may be thus stated :

It is not the aim of our publications to supply a medium for the description of untried projects or theories. We want to know, not what a man has imagined will work satisfactorily, but what he has actually accomplished in reducing the cost of work, or increasing its efficiency. If a machine or a structure has been built, and has either succeeded or failed, it is interesting and valuable to know the reasoning which led to the adoption of the type which was followed in its construction, but until a result has been reached in actual experiment, we are not justified in spending the money of the Society in publishing speculations as to what ought to happen under certain conditions, but which never has happened.

The Board, without endorsing these views, submits them to the members.

The Proceedings contain, in addition to the reports mentioned :

Announcement of Meetings to be held. Topics discussed, &c.

Book Notes. Short Articles on:—

Analytical Mechanics.

Iron Highway Bridges.

Reports of the Vienna International Exhibition.

List of Additions to Library and Museum.

List of Members, with Addresses, Changes and Corrections.

Minutes of Meetings of the Board of Direction and of the Society.

List of new and technological Books.

Notes and Memoranda. Short Articles relating to

American Tunneling.

Centennial Commission of the Society.

Dams for Reservoirs.

Metric System of Weights and Measures.

Mount Washington Railway.

Ninth Annual Convention.

Tests of American Iron and Steel.

Water Supply from Bronx River.

Statement of the Finances of the Society.

Volume V of Transactions and Volume II of Proceedings closed with the December number, and an Index and Title Page for each has been issued. The index for the latter being full and specific.

As appendix to Translations, the following have been received during the year :

Discussions on Technical Education, at the Washington meeting of Am. Ins. of Mining Engineers, and at a joint meeting in Philadelphia with the Am. Soc. of Civil Eng., by arrangement between the two associations.

Report of the Chief Engineer of the New York and Brooklyn Bridge, January 1st, 1877, by courtesy of the Engineers.

A late ruling of the Postal Department prevents further issue of matter which is not printed and paged with Transactions. Copies will, however, be distributed to Members in the ordinary way, upon payment of necessary expenses for postage.

During the year the Library has been increased by the contributions of the members and others interested in its growth, the addition of the collection made by the Centennial Commission of the Society during the International Exhibition in Philadelphia, and by purchase.

There has been added in that time :

Books, bound and unbound, and pamphlets.....	1019
Manuscripts (bound volumes).....	5
Maps, plans, drawings, charts, photographs and engravings.....	702
Models and specimens.....	33

These do not include magazines and papers contributed to the Society by publishers or received in exchange for Transactions, as follows :

Annales des Ponts et Chaussées.....	Quarterly,	Paris.
Deutsche Bauzeitung.....	Semi-Weekly,	Berlin.
Engineering News.....	Weekly,	Chicago.
Engineering.....	"	London.
Iron.....	"	"
Journal of the American Iron and Steel Association.....	"	Philadelphia.
Journal of the Society of Arts.....	"	London.
Manufacturer and Iron World.....	"	Pittsburgh.
Monthly Record of Scientific Literature.....	Monthly,	New York.
Official Gazette of the United States Patent Office.....	Weekly,	Washington.
Railroad Gazette.....	"	New York.
Stummer's Ingenieur.....	"	Vienna.
The American Architect and Building News.....	"	Boston.
American Chemist.....	Monthly,	New York.
Army and Navy Journal.....	Weekly,	"
Builder.....	"	London.
Building News and Engineering Journal.....	"	"
Chicago Railway Review.....	"	Chicago.
Commissioners of Patents Journal.....	Semi-Weekly,	London.
Engineer.....	Weekly,	"
Engineering and Mining Journal.....	"	New York.
Iron Age.....	"	"
Journal of the Franklin Institute.....	Monthly,	Philadelphia.
Manufacturer and Builder.....	"	New York.
Polytechnic Review.....	Weekly,	Philadelphia.
Railway Age.....	"	Chicago.
Railway World.....	"	Philadelphia.
Telegraphic Journal and Electrical Review.....	Semi-Monthly,	London.
Van Nostrand's Eclectic Engineering Magazine.....	Monthly,	New York.

The following are subscribed for :

Allgemeine Bibliographie für Deutschland.....	Weekly,	Leipzig.
Bibliographie de la France.....	"	Paris.

Bookseller.....	Monthly,	London.
Publishers' Weekly.....	Weekly,	New York.
Scientific American, with Supplement.....	"	"
United States Official Postal Guide.....	Quarterly,	Boston.
American Library Journal.....	Monthly,	New York.
American Bookseller.....	Semi-Monthly,	"
Journal of Artillery and Military Engineering.....	Monthly,	Vienna.

The Society has received during the year, in exchange for its "Transactions," official publications of the following associations, in some instances for preceding years:

American Institute of Architects.....	New York.
American Institute of Mining Engineers.....	Philadelphia.
Architecten und Ingenieur Verein Zu Hanover.....	Hanover.
Argentine Scientific Society.....	Buenos Ayres.
Associaçao dos Engenheiros Civis Portuguezes.....	Lisbon.
British Patent Office.....	London.
Boston Public Library.....	Boston.
Civil Engineers' Club of the Northwest.....	Chicago.
Department of Agriculture.....	Washington.
Engineers' Club of St. Louis.....	St. Louis.
Essayons' Club, Engineer Corps, U. S. A.....	Willet's Point.
Hanover Society of Architects and Engineers.....	Hanover.
Hungarian Society of Engineers and Architects.....	Buda Pest.
Institution of Civil Engineers.....	London.
Institution of Engineers and Shipbuilders of Scotland.....	Glasgow.
Institution of Mechanical Engineers.....	Birmingham.
Institution of Mining and Mechanical Engineers.....	Newcastle.
Iron and Steel Institute.....	London.
Oesterreicher Ingenieur und Architekten Verein.....	Vienna.
Royal United Service Institution.....	London.
Sachsischer Ingenieur und Architekten Verein.....	Dresden.
Society of Engineers.....	London.
Société des Ingénieurs Civils.....	Paris.
Swedish Society of Civil Engineers.....	Stockholm.
Thomason College of Civil Engineers.....	Roorkee.

The following associations also have arranged to exchange with the Society:

Imperial School at Moscow.....	Moscow.
Russian Imperial Technical Society.....	St. Petersburg.

Including the Serials received during the year, and making altogether about 70 unbound volumes, the present state of the Library is somewhat as follows:

Books bound, unbound, and pamphlets.....	6641
Manuscripts.....	90
Maps, plans, drawings, charts, photographs and engravings.....	1796
Models and specimens.....	191

As has appeared in the current list of Additions to the Library and Museum, published in Transactions, much of the increase here noted, has been through the Centennial Commission of the Society. A report of its operations will be presented at this meeting.

As stated in the last Report of the Board: "A catalogue of the Library has been for some time in preparation and is nearly complete. The plan adopted is known as the card system: the general and particular title of the work, author's name, description of style, donor's name (if the work is donated), shelf and case numbers are for each book, treatise, or author, written upon a card; these cards are arranged alphabetically in cases. Under such a system, additions or changes in the catalogue may be easily and promptly made, and the fullest information given regarding any contents of the Library."

While the card catalogue is useful in the Library room, the value of the Library to members will be greatly enhanced by the publication of a printed catalogue of the books. The issue of such a catalogue showing the present condition of the Library would, undoubtedly, result in an increased interest in the Library and large additions to it.

During the past year the finances of the Society have not been such as to warrant any considerable expenditure in this direction. The illness of the Secretary in the early part of the year and the confusion attending the removal and the fitting up of the new rooms, have caused delay.

The thanks of the Society are again due to members for their contributions to the Library; formal acknowledgments of their donations appear regularly in Proceedings.

As remarked in last Report, the Library contains many volumes of papers, journals, and other serial works, sets of reports, pamphlets, and the like, more or less complete, which should be bound, to preserve them as well as to fit them for ready use. It is still deficient in important books of reference, and this deficiency can only be supplied gradually by purchasing such books from time to time as the condition of the treasury permits. More has been done in this direction during the past year than in any previous twelve months.

The Board of Censors to award the Norman Medal, made report at the last Annual Meeting, that a single paper only had been submitted to them, and for reasons stated, declined to make any award.

In compliance with the "Code of Rules," a premium to consist of books, to cost \$70 currency, was in May last, offered for the second best paper to compete for the medal this year.

Another years experience causes this Board to call again attention to the desirability of a change in the conditions of award of this medal, so that papers read before the Society during the year, as well as those specially prepared for competition, may be eligible for the prize."

Committees at the beginning of the past Society year, charged with the examination of special professional subjects, were as follows:

On "Tests of American Iron and Steel," appointed June 6th, 1872, W. Sooy Smith, Chairman. This Committee made report at the Annual Meeting and at the Annual Convention, and was continued.

On the "Nomenclature and Classification of Masonry," J. James R. Croes, Chairman, ordered December 1st, 1875. This Committee made report at the Annual Meeting, and was continued.

On the "Gauging of Streams," J. James R. Croes, Chairman, December 1st, 1875. This Committee made report at the Annual Meeting, and was continued.

On "American Engineering at the Centennial Exhibition," Theodore G. Ellis, Chairman, appointed December 1st, 1875. This Committee is elsewhere referred to.

On "Resistances of Railway Trains," William P. Shinn, Chairman, ordered May 3d, 1876. This Committee reported at the Annual Meeting, and was continued.

On "Uniform Accounts and Returns of Railroad Companies," William P. Shinn, Chairman, appointed August 16th, 1876. This Committee reported at the Annual Meeting, and was continued.

On "Metric System of Weights and Measures," Clemens Herschel, Chairman. The work of this Committee is elsewhere referred to.

No similar Committees were appointed during the past year.

The previous location of the Society's rooms seemed to be generally acceptable to members; the lease under which they were held, expired April 30th last, and the large quantity of valuable material accumulated by the Centennial Commission at the Exposition in Philadelphia, had to be cared for, either by storing in bulk, or by arranging so that observers might examine and use it. As indicated in reports of the committees charged with this matter, it was proposed to co-operate with kindred organizations, and either by purchase, or lease on satisfactory terms, thereby secure permanent quarters, specially fitted for the use required, and which shall be reasonably safe from fire.

The action of the existing Committee was reported at the last Convention. The present Society house has been leased up to May 1st, 1879. In the meanwhile it is recommended that the consideration of the best means for securing a permanent location be continued.

At the 23d Annual Meeting, a communication was presented, referring to the adoption of the metric system of weights and measures, and proposing that, whether the Society petition Congress to fix a date—say three years hence—when such shall be the legal system, be submitted to vote of members by letter ballot. After discussion, the matter was laid on the table. Further communications on the subject were offered; and at the Eighth Annual Convention, after discussion, the matter, in specific form, was, under By-Laws relating to appointment of special committees on engineering subjects, referred to the Board, which ordered that the same be submitted to the Society without comment for vote by letter ballot. A majority approving, a committee consisting of Messrs. Clemens Herschel, Robert Briggs, Frederick Brooks, Louis G. F. Bous-

careen, and another (who declined to serve) was appointed under the resolution.

At the Ninth Annual Convention the committee presented a report, embodying a memorial to the Senate and House of Representatives of the United States, and the following resolution :—

“Resolved, That the form of memorial submitted be adopted by the Society, be signed by the President and Secretary and transmitted to the two houses of Congress.”

The resolution was submitted to the Society for vote by letter ballot, and the memorial was not adopted.

A report from the committee at this meeting is expected.

At the same time this resolution was submitted to vote, other resolutions offered at the Ninth Annual Convention, referring to the enactment by State Legislatures of a law for the inspection of bridges; what is the best system of weights and measures for the use of engineers in the United States; the reading of papers at Annual Conventions; and the division of Annual Conventions into sections were also submitted, and neither was adopted.

Quoting from the last Annual Report of the Board :

*“At the Eighth Annual Convention reference was made to a clause in Art. XX of the Constitution providing that ‘in the elections for membership of either class * * * three ‘or more ballots cast in the negative shall exclude,’ and it was considered whether this number should not be increased; it being urged that the provision was adopted when there were of voting members about one-tenth of the present number. After debate, the matter was laid upon the table; one argument against change being, that there is no provision in the Society’s laws to get rid of an unworthy member.”*

At the succeeding Annual Convention, amendments to the Constitution, covering these points were proposed; these are to be considered at this meeting.

Another amendment to the Constitution was then also proposed, declaring that “the membership of any person shall begin on the day of his election.” This, if adopted, will remove the difficulty preventing issue of the certificates of membership, which was referred to in the preceding report of the Board.

Soon after the organization of the Society in 1852, under the name of the American Society of Civil Engineers and Architects, steps were taken to secure its incorporation according to the laws of the State of New York. It subsequently became necessary to legalize the change of the Society’s name to its present title, but no record of former proceedings could be found. During the past year, the proper measures were taken whereby the Society was duly incorporated, April 17th, last. The act was approved and perfected by the Board of Direction May 21st, and by the Society June 6th.

The general report of the Treasurer of the Society on the state of its finances for the Society year ending November 6th, 1877, is herewith presented.

Deaths of Members during the year, are announced as follows :

George W. R. Bailey, admitted as Member, July 24th, 1872, who died December 14th, 1876.

Robert L. Cooke, admitted as Member, October 23d, 1872, who died August 11th, 1877.

Charles S. Emack, admitted as Member, January 24th, 1872, who died July 27th, 1877.

Edward W. Ensign, admitted as Fellow, June 23d, 1870, who died October 1st, 1877.

William Grain, admitted as Member, February 16th, 1870, who died January 10th, 1877.

James P. Kirkwood became Member upon the organization of the Society, November 2d, 1852, was a Director and President, who died April 22d, 1877.

Louis Nickerson, admitted as Member, October 29th, 1872, who died May 6th, 1877.

William B. Ogden, admitted as Fellow, March 24th, 1870, who died August 3d, 1877.

Henry Tyson, admitted as Member, July 13th, 1872, who died September 2d, 1877.

J. Butler Wright, admitted as Fellow, May 24th, 1870, who died October 31st, 1877.

Memoirs of the deceased are in preparation, and will be presented in due course.

Respectfully submitted,

G. LEVERICH, Secretary.

REPORTS OF COMMITTEES.

REPORT OF COMMITTEE ON NOMENCLATURE AND CLASSIFICATION OF MASONRY.

PRESENTED NOVEMBER 7TH, 1877.

The Committee appointed to inquire into the feasibility of securing a uniformity of practice in the nomenclature and classification of masonry, respectfully report, that after due consideration of the subject, they are of the opinion that the desired object cannot be obtained suddenly, nor by any direct action of the Society. Considerable diversity of practice exists in different parts of the country which can only be overcome by degrees. Believing that the best method of securing uniform practice will be to set forth certain definite names for tools and classes of work-

manship, and request Members of the Society to use only such names in their specifications and practice generally, until, by custom, they become recognized as representing what is intended, the Committee present herewith a paper containing such names, with descriptions of the tools and work, and recommend that Members of the Society be requested to use them as above suggested.

J. J. R. CROES,
W. E. MERRILL,
E. B. VAN WINKLE,
Committee.

REPORT OF COMMITTEE ON GAUGING OF STREAMS.

PRESENTED NOVEMBER 7TH, 1877.

The Committee appointed to inquire into the feasibility of obtaining for the use of engineers records of systematic gaugings of streams of known watershed, and of the rainfall on their water sheds, respectfully report, that so far their efforts to secure the coöperation of persons or corporations having charge of works the operation of which involves the use of the waters of a stream, have not met with much success. They take pleasure in stating, however, that the Commissioner of Public Works of New York City, who is a Member of the Society, has promised to furnish the Society with the results of the gaugings of rain fall and flow at three points in the Croton basin, where observations are taken, and also that the Commissioners of the Department of Public Parks of New York have expressed their intention to institute systematic gaugings of the streams under their jurisdiction in the newly annexed portion of the city, to aid in the determination of questions relating to the sewerage and drainage of that district, and have promised to furnish the Committee with the results of the same.

In reply to a request for coöperation, the Secretary of the Smithsonian Institute states that the meteorological observations formerly under his control have been transferred to the Signal Office of the U. S. Army. Professor Henry has kindly promised to furnish to the Society a copy of the new edition of the Smithsonian work on rain-fall in the United States as soon as it is published.

The Committee earnestly request Members who are connected with any works on which observations of the desired kind might be made, to use every effort to have them undertaken. It is not necessary, nor is it advisable, to attempt to begin on too large a scale, or with any effort at extreme accuracy. If only two or three observers can be enlisted at first, their operations and the resulting information will, it is believed, excite the interest of others.

The Committee will gladly aid, by advice and suggestions, those who may desire to institute systematic measurements.

J. J. R. CROES.
Chairman.

REPORT OF COMMITTEE ON UNIFORM ACCOUNTS AND RETURNS OF RAILROAD CORPORATIONS.

PRESENTED NOVEMBER 7, 1877.

The Committee appointed August 16th, 1876, on "Uniform Accounts and Returns of Railroad Companies," respectfully reports as follows:

On the day previous to the last annual meeting, the Committee had an interview with the gentlemen selected by the Commissioners of Massachusetts, to supervise the accounts and returns of railroad companies in the State of Massachusetts, at which several important suggestions were made, some of which were adopted by the Commissioners, and made a portion of their regulations. Your Committee have thought it best, before taking further steps in the matter, to await the result of the first years' operation of the system introduced by the Massachusetts Com-

missioners, and which has been adopted by the Commissioners of Connecticut, and of most of the other New England States.

It seemed to the Committee that if the result in those States was satisfactory, it would be far less difficult to secure the adoption of a similar system in the other States, and that on the contrary, if the system was found to need material modifications, such changes might be made as would make it acceptable before its adoption in the other States.

We therefore recommend that the Committee be continued.

Respectfully submitted,

WM. P. SHINN, }
O. CHANUTE, } Committee.
FRED. DE FUNIAK, }

REPORT OF COMMITTEE ON TESTS OF AMERICAN IRON AND STEEL.

PRESENTED NOVEMBER 7, 1877.

So full an account of the Board to test American metals, was recently given to the Society by Prof. R. H. Thurston, Secretary of the Board (see Proceedings, Vol. III, p. 26), that no further statement is needed to in-

form the Society fully of its history, work, and present status.

Your Committee deems it inexpedient to ask Congress, during its special session, for any appropriation of money for the uses of

the Board. And this conclusion has been reached after conference with its President. But the way should be thoroughly prepared for an application to be made during the next regular session of Congress for the repeal of the legislation terminating the existence of the Board when the money it now has is expended, and for the small appropriation that will be required to pay its current expenses. The expenditure of ten thousand dollars per annum, for three years, will enable the Board to bring up the knowledge of American metals even with the progress already made and to be made during that time, in their manufacture and use. The civil engineers, architects, mechanics, manufacturers and scientists of the United States have joined in asking Congress, through our Society, to institute and sustain a set of tests of American iron and steel. A Board has been organized to conduct such tests. Congress has appropriated, and the Board has expended, nearly one hundred thousand dollars. Elaborate and

very perfect preparations have been made for the tests and investigations proposed, and great hopes and expectations are entertained as to the benefits to be realized.

If we permit this effort to fail, all the work already done will be measurably lost. And when can it be undertaken again with so good a prospect of success? Discouraged by our failure, we will go on again for years groping for the knowledge which the Testing Board is organized to procure. These years being marked at short intervals with disastrous blunders of architects, engineers, builders and mechanics. On the other hand, if the Board is sustained, the knowledge obtained will be conducive to the great material interests of our people, and it will enable us to design and execute works creditable to ourselves and to American engineering.

Respectfully submitted,

WM. SOOY SMITH,

Chr. of Com. on Tests, &c.

MAYWOOD, ILL., Oct. 26th, 1877.

REPORT ON TIME AND PLACE OF TENTH ANNUAL CONVENTION.

PRESENTED NOVEMBER 7TH, 1877.

The Secretary, as Committee on Time and Place of the Tenth Annual Convention, has to report, that replies to circulars sent out have been received from 111 members.

Of these, as to time, 27 name June, 15 May, 7 July, 3 April, 2 February, 1 each January, March and September, and 54 express no choice; and as to place, 17 name San Francisco, 13 Boston, 10 New York, 4 each Chicago and Washington, 3 each Baltimore, Cincinnati, Cleveland and Niagara, 2 St. Louis, 1

each Bethlehem, Charleston, Paris and Providence, and 45 express no choice.

It will be seen, there is not a majority of votes in favor of either time or place named.

The Secretary has received letters from Messrs. Frederick Brooks and Joseph P. Davis, of Boston, relative to the Convention being held in that city, and these with this report, are respectfully submitted for such action as may now be deemed best.

G. LEVERICH, Committee.

REPORT OF THE COMMITTEE ON METRIC SYSTEM OF WEIGHTS AND MEASURES.

PRESENTED NOVEMBER 7TH, 1877.

G. LEVERICH, Esq.,

Sec'y Am. Soc. Civ. Eng's :

DEAR SIR,—The Committee on Metric System of Weights and Measures, respectfully ask leave to report at the next Annual Con-

vention. Will you please present this report at the Annual Meeting?

Truly yours,

CLEMENS HERSCHEL,

Chairman, for the Committee.

REPORT OF THE BOARD OF CENSORS FOR THE AWARD OF THE NORMAN MEDAL.

PRESENTED NOVEMBER 7TH, 1877.

At a meeting of the Censors designated by the Code of Rules for the award of the Norman Medal, held on the 27th October, 1877 : Present—George S. Greene, President of the Society ; F. A. P. Barnard, President of Columbia College ; J. G. Barnard, Corps of Engineers, U. S. Army ; two papers were received in competition for this medal.

The Norman Medal was awarded to the au-

thor of "Notes and Experiments on the Use and Testing of Portland Cement."

Books to the value of the medal not awarded last year, were awarded to the author of "On Igniting Blasts by means of Electricity."

GEORGE S. GREENE,

F. A. P. BARNARD.

J. G. BARNARD.

Censors.

REPORT OF THE COMMITTEE ON QUARTERS FOR THE SOCIETY.

PRESENTED NOVEMBER 7TH, 1877.

The Committee on Quarters for the Society, reports that the lease of the house now occupied by the Society will expire on May 1st, 1879. The Committee recommends that the Society should take measures to continue the discussion in respect to procuring a permanent home, either here or in some other convenient part of the city. The confusion and loss, and consequent interruption of the cur-

rent work of the Society, which has resulted from the recent necessary transfer from one house to another, have impressed the Committee more fully than ever with the great desirability of securing a place where there will be no probability of similar disturbance.

For the Committee,

JOHN BOGART,
Chairman.

REPORT OF THE COMMITTEE ON FINANCE.

PRESENTED NOVEMBER 7TH, 1877.

The Committee on Finance respectfully presents the following Report for the year ending November 6, 1877 :

Before referring to the expenditures properly belonging to the fiscal year ending November 6th, 1877, it is proper to state that a number of bills due prior to November 1st, 1876, were not presented till after that date, as follows :

Rent up to Nov. 1, 1876.....	\$400 00
Ledger, and for transferring the accounts of the administration of Treasurer Morse.....	75 00
Journal printing for August, 1876.....	214 75
“ “ “ Sept., “.....	113 00
“ “ “ Oct., “.....	162 50
Printing 1,000 Indexes to Proceedings.....	100 00
	<hr/>
	\$1,065 25
Also an unsettled account of W. C. Bryant & Co. for printing, &c., done prior to Nov. 1, 1876—some of the items extending back to 1872.....	755 64
	<hr/>
	\$1,820 89

This sum had to be paid during the present year.

The Treasurer's Report shows as follows :

RECEIPTS, &c.

Balance. Nov. 1, 1876.....	\$1,274 97
Entrance fees.....	1,010 00
Dues.....	7,427 96
Sales of Transactions and Diplomas.....	240 45
Fellowship subscription.....	150 00
Advertisements.....	492 25
Interest, Normal Medal Fund.....	70 00
“ Fellowship “.....	607 56
Miscellaneous.....	33 50
	<hr/>
	\$11,306 69
Deduct (included above) two drafts deposited for collection, and not yet collected, \$30 and \$10.....	40 00
	<hr/>
	\$11,266 69

PAYMENTS.

Rent.....	\$1,600 00
Janitor, heat, furniture, fitting rooms, moving, water, &c.	1,045 79
Library, purchases, catalogue.....	926 18
Transactions and Proceedings.....	2,766 19
Publishing Report on Technical Education.....	216 84
Insurance.....	55 80
Postage.....	500 35
Salaries.....	3,000 00
Stationery and Printing.....	325 97
Other expenditures.....	194 90
	<hr/>
	\$10,632 02
Balance on hand.....	634 67
	<hr/>
	\$11,266 69

We find, also, bills just presented or mentioned by the Secretary, yet unpaid, as follows :

One quarter's rent.....	\$400 00
Scudder & Curtis, legal services.....	160 88
Photo. Lith. Co.....	50 75
“ “.....	4 25
Stationery, Ketchum.....	6 10
Water Rent.....	20 90
W. C. Bryant & Co., bill of printing, dating back to March, 1877.....	1,167 70
	<hr/>
	\$1,810 58

The amount of arrearages of members is very large.

Unless delinquent members shall soon pay up a considerable portion of back dues, the Society will be compelled to curtail its expenses in some way.

It will be noted that almost exactly the same amount of liability is carried from this to the next year as was brought to this year from the last.

It would not be proper to so exhaust our funds as to immediately pay this and also the current expenses as they become due ; but the appropriations, the liabilities, and especially the presentation of accounts, should in the future be so managed that gradually, and as soon as possible, bills should be paid soon after being incurred, and the income and outgo of each year be kept clearly and distinctly in proper adjustment.

Respectfully submitted,

W. MILNOR ROBERTS,
WILLIAM H. PAINE,
M. N. FORNEY.

REPORT OF TREASURER.

PRESENTED NOVEMBER 7TH, 1877.

Treasurer's Statement of Receipts and Disbursements for the Year.

RECEIPTS.

Balance, November 1, 1876.....	\$1,274 97
Entrance Fees.....	1,010 00
Dues.....	7,427 96
Sales of Transactions and Diplomas.....	240 45
Fellowship Subscription.....	150 00
Advertisements.....	492 25
Interest Norman Medal Fund.....	70 00
Do. Fellowship Fund.....	607 56
Miscellaneous.....	33 50
	<hr/>
	\$11,306 69
Deduct two drafts deposited for collection and not yet cashed.....	40 00
	<hr/>
	\$11,266 69

DISBURSEMENTS.

Rent.....	\$1,600 00
Janitor, Heat, Furniture, Fitting Rooms, Moving, Water, Ice and Gas..	1,045 79
Library, Purchases, Catalogue.....	926 18
Transactions and Proceedings.....	2,766 19
Publishing Report on Technical Education.....	216 84
Insurance.....	55 80
Postage.....	500 35
Salaries.....	3,000 00
Stationery and Printing.....	325 97
Other expenditures.....	194 90
	<hr/>
	\$10,632 02
Balance now on hand.....	694 67
	<hr/>
	\$11,266 69

JOHN BOGART, Treasurer.

MEMORIAL PROPOSED BY H. F. WALLING.

PRESENTED NOVEMBER 7TH, 1877.

To the Honorable the Senate and House of Representatives of the United States in Congress assembled:

The American Society of Civil Engineers respectfully represents to your honorable bodies that the triangulation of the United States Coast Survey, wherever it extends, affords a convenient and accurate basis for the locations of roads, railroads and public works of all kinds, as well as for topographical and other surveys;—a basis which, for precision and completeness, is otherwise practically unattainable.

And the said Society, according their hearty approval of the United States laws whereby the Coast Survey Department is authorized to extend its triangulations over States where scientific Surveys are ordered by the State legislatures, respectfully petitions your honorable bodies to make the necessary appropriations for continuing such triangulations as may be called for under the said laws, whereby the valuable work of the Coast Survey may be more fully utilized, to the great advantage of all portions of the country.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Africa, a large Map of Tropical —. Commander Cameron, R. N., C. B. Showing the results of all recent explorations. London. Daldy & Isbister. (Announcement.)
 Algiers, Walks in—. L. G. Seguin. London. Crown 8vo, illus. and maps. Daldy & Isbister. (Announcement.)
 Amazon, Fifteen Thousand Miles on the — and its Tributaries. C. Barrington Brown, Assoc. R. S. M., and William Lidstone, C. E. London. Stanford. (Announcement.)
 Architecture, an Attempt to Discriminate the Styles of — in England, from the Conquest to the Reformation; with a Sketch of the Grecian and Roman Orders. By the late Thomas Rickman, F. S. A. Seventh —. The Albert Memorial, Hyde Park; Its History and Description. With numerous

illustrations on steel. James Dafforne, London. Virtue & Co. (Announcement.)
 —. American Cottage Homes. Palliser. New York. 4to, illus. Bicknell & Co. \$5.
 —. Cottages: How to Plan and Build them, to ensure Health, Economy and Comfort, with Hints on Fittings and Furniture. W. Herbert, London. Benrose & Sons. (Announcement.)
 —. The Geometry and Optics of Ancient —. Illustrated by Examples from Thebes, Athens, and Rome. John Pennethorne. In folio, with 56 plates in Line and Colour. London. Folio. Williams & Norgate. (Announcement.)
 —. The Architectural History of the University and Colleges of Cambridge. By the late Professor Willis, M. A. With numerous

- Edition, with considerable additions, chiefly historical, by John Henry Parker, C. B., M. A., F. S. A., and numerous illustrations, London. *Parker & Co.* (Announcement.) Illustrations. Edited by John Willis Clark, M. A. London. *Cambridge Warehouse.* (Announcement.)
- , Manchester Town Hall: A series of Twenty Picturesque Photographs of the Exterior and Interior of the Building. J. McLeod. With Descriptive Letterpress, revised by the Architect. Manchester. *Heywood & Son.* (Announcement.)
- , Scottish Woodwork of the Sixteenth and Seventeenth Centuries. By J. W. Small. Edinburgh. *David Douglas.* (Announcement.)
- , a Manual of Naval —, for Officers of the Royal Navy, Mercantile Marine, Ship-owners and Shipbuilders. W. H. White, Assistant Constructor, Royal Navy. London. 8vo, illus. *John Murray.* (Announcement.)
- Art, Handbooks. (New Volume.) Bronzes. C. Drury E. Fortnum. New York. 12mo, illus. *Scribner, Welford & Armstrong.* \$1.
- , Lubke's History of —. Vol. 1, A New Translation from the Seventh German edition. Edited, with Notes, by Clarence Cook. New York. *Dodd, Mead & Co.* (Announcement.)
- , Contemporary — in Europe. S. G. W. Benjamin. New York. 8vo, illus. *Harpers.* \$3.50.
- , Persian —. Major R. Murdoch Smith, R. E. New Edition, with additional illustrations. London. *Chapman & Hall.* (Announcement.)
- , at Home Series. New Volumes. The Drawing Room. By Mrs. Orrinsmith. The Dining Room. By Mrs. Loftie. The Bed Room and Boudoir. By Lady Barker. London. *Macmillan & Co.* (Announcement.)
- Arctic Expedition, Shores of the Polar Sea: a Narrative of the — of 1875-76. Dr. Edward L. Moss, H. M. S. *Alert.* With sixteen large Chromo-Lithographs and numerous Engravings, from Drawings made on the spot by the Author. London. *M. Ward & Co.* (Announcement.)
- , our Life in the Polar regions, or how we lived on the *Alert* during a voyage of discovery. Capt. Aibert Hastings Markham, R. N. London. 8vo, illus. *Daldy, Isbister & Co.* (Announcement.)
- Australia, the Fifth Continent, with the adjacent Islands. Being an Account of —, Tasmania, and New Guinea, with Statistical Information to the latest date. Charles H. Eden. London. Crown 8vo, map. Society for *Prom. Christian Knowledge.* 5s.
- Brazil, Handbook of —. M. G. and E. T. Mulhall. Buenos Ayres. 12mo, illus. (*Stanford, London.*)
- Building Construction. Timber and Iron. R. Scott Burn, C. E. (Advanced Science Series.) London. *Collins.* (Announcement.)
- Cable Making and Suspension Bridges. With special references to the Cables of the East River Bridge. Wm. Hildenbrand. (Van Nostrand's Science Ser., No. 32.) New York. 16mo. *Van Nostrand.* \$0.50.
- Ceramics, The History of Ceramic Art in Great Britain, from the Earliest Period to the Present Day. Licewellyn Jewitt, F. S. A. With nearly 2000 Engravings. London. *Virtue & Co.* (Announcement.)
- Chemistry, Handbook of Volumetric Analysis. Edward Hart. New York. *Wiley & Sons.* \$2.50.
- , Outlines of Modern —. Organic. Based in part upon "Riche's Manuel de Chimie." C. G. Wheeler. Cincinnati. 12mo. *Jansen, McClurg & Co.* \$1.75.
- , Tables for Systematic Qualitative Chemical Analysis. 8vo. *Nashville (Tenn.)*
- , Combined Handbook and Note-book for Students of Inorganic Chemistry, preparing for the Examinations of the Science and Art Department (Elementary and Advanced). Oxford and Cambridge Local, and London University. James Monckman. Leeds. 12mo. (*Simpkins, London.*) 1s.
- Chimneys, Boiler and Factory —: their Draught Power and Stability; and on Lightning Conductors. Robert Wilson. London. *Lockwood, Crosby & Co.* (Announcement.)
- Cities and Cemeteries, The — — of of Etruria. George Dennis, H. B. M. Consul at Palermo. New Edition. Revised from Recent Visits to the Etruscan Sites, with a Chapter on Bologna. With 20 Plans and 150 illustrations. Two vols. London. 8vo. *John Murray.* (Announcement.)
- Cyprus, Its Ancient Cities, Tombs, and Temples. A Narrative of Researches and Excavations during ten years' residence in that Island. Louis P. di Cesnola. With maps and 200 illustrations. London. 8vo. *John Murray.* (Announcement.)
- Dock and Port Charges of the United Kingdom. With colored Maps of Ports and Rivers. London. 8vo. *C. Wilson.* 12s. 6d.
- Drainage, By-Laws and Regulations with reference to House —, adopted by the Uppingham Sanitary Authorities, and allowed by the Local Government Board. With Explanations and Suggestions by Rogers Field, M. Inst. C.E. London. 8vo, illus. *Spons.* 1s.
- House. Regulations to be observed on the Drainage and Water Supply of Town and Country Houses, as adopted by the Corporation of Nottingham and other Sanitary Authorities. With illustrations. By M. Ogle Tarbotton, M. Inst. C. E. London. 8vo, illus. *Spons.* 1s.
- Drawings, Patent Working —. By H. and T. C. Batchelor. These drawings, illustrating Mechanical Movements, are made upon a principal entirely new, the idea being to facilitate the study of the working of machines, by showing them in action on the drawing, and making the working parts describe, with the greatest precision and accuracy, the same paths and movements as they would do in the machine itself. London. *Macmillan & Co.* (Announcement.)
- Egypt, History of —, from the Earliest Period: derived from Monuments and Inscriptions. By Dr. Brugsch, of Göttingen. Translated by the late H. Danby Seymour, F.R.G.S. London. *J. Murray.* (Announcement.)
- Upper —, its People and its Products. A descriptive account of the Manners, Superstitions, Customs, and Occupations of the People of the Nile Valley, the Desert, and the Red Sea Coast, with sketches of the Natural History and Geology. Translated from the German of C. R. Kunzinger, M.D., formerly Egyptian Sanitary Physician at Koser, on the Red Sea. With a Prefatory Notice by Dr. George Schweinfurth. London. 8vo, illus. *Blackie & Son.* 14s.

- Electricity and the Electric Telegraph. George B. Prescott. London. 8vo, illus. *Spons.* 18s.
- , The Student's Text-Book of —. Henry M. Noad, Ph. D. New edition, revised and enlarged, with additions on Telegraphy by G. E. Preece, Esq. London. *Lockwood, Crosby & Co.*
- , Compendium der Elektrischen Telegraphie. With 169 cuts and 47 lithogr. plates. Wiesbaden. *L. Wendenbach.* 15s.
- , The Application of — to Railway Working. W. E. Langdon, Engineering Superintendent of Post-office Telegraphs. With numerous illustrations. London and New York. *Macmillan & Co.*
- Furniture, The History of —. Researches and Notes on Objects of Art which form Articles of Furniture or would be interesting to collectors. By Albert Jacquemont. Translated from the French and Edited by Mrs. Bury Palliser. London. Imp. 8vo, 200 illus. *Chapman & Hall.* (Announcement.)
- Gas, The — Consumer's Handy Book. William Richards, C.E. London. 18mo. *Spons.* 6d.
- A Practical Treatise on the Manufacture and Distribution of Coal —. William Richards. With numerous wood engravings and large plates. London. Demy 4to. *Spons.* 28s.
- Geology of New Hampshire. Prof. C. H. Hitchcock. Vol. 2. On Stratigraphical Geology. Illus. with heliotype, maps, and charts. Concord, N. H. 4to, illus. *E. C. Eastman.* \$10.00.
- Geometry of Cycloids. A Geometrical Investigation of the Principal Properties of the Cycloid, Epicycloid, Hypocycloid, Trochoids, and Associated Curves; to which is appended an Application of the Cycloid to determine, by Graphical construction, the Orbital Motion of Planets and Comets, and to Measure the range of Matter projected from the Sun. With numerous diagrams. By Richard A. Proctor, B.A., Cantab. London. *Longmans.* (Announcement.)
- Health. Domestic Hygiene: A Guide to — and Healthy Homes. George Wilson, M.D. London. *Churchill & Co.* (Announcement.)
- A hand-book of Analysis of Water, Air, and Foods for the Medical Officer of — With Engravings. Cornelius B. Fox, M.A. London. *Churchill & Co.* (Announcement.)
- Heating. A Manual of — and Ventilation in their practical applications, for the use of Engineers and Architects, embracing a series of Tables and Formulas for dimensions of Heating-Flow, and Return Pipes for Steam and Hot Water Boilers, Flues, etc., etc. F. Schumann. New York. 12mo, illus. *Van Nostrand.* \$1.50.
- Heat in relation to Steam and the Steam-Engine; an Elementary Treatise. George Shaw. London. 8vo. *Macmillan & Co.* 4s 6d.
- The Analytical Theory of — Joseph Fourier. Translated, with Notes, by A. Freeman. London. *Cambridge Warehouse.* (Announcement.)
- Holland. Through — or Towns and Customs of the Dutch. Charles W. Wood. London. demy 8vo, illus. *Bentley & Sons.* 12s.
- Iron and Steel Institute, Journal of —. With 11 Plates. London. Demy, 8vo. *Spons.* New York. \$3.75.
- London, Old and New — Vol. V., with about 200 illustrations and maps. London. *Cassell, Petter & Galpin.* 9s.
- Walks in — Augustus J. C. Hare. With 100 illustrations by the author. 2 vols. London. Crown 8vo. *Daldy, Isbister & Co.* (Announcement.)
- Machine Construction. E. Tomkins, Queen's College, Liverpool. (Advanced Science Series.) London. *Collins.* (Announcement.)
- Mannures — on Artificial — Their Chemical Selection and Scientific Applications to Agriculture. George Ville. Translated from the author's MSS., and edited by William Crookes, London. *Longmans.* (Announcement.)
- Mechanics — a Manual of — of Engineering and of the Construction of Machines. Phil. Julius Weisbach. Vol. 2, Application of Mechanics to Machines. Trans. by A. Jay DuBois. New York. 8vo., illus. *Wiley & Sons.* \$5.00.
- Metallurgy: The art of extracting metals from their Ores, and adapting them to various purposes of manufacture. Fifth Division. Silver. John Percy, M.D., F.R.S. London. *John Murray.* (Announcement.)
- Mining, Records of — in Scotland. R. W. Cochran Patrick. Edinburgh. *David Douglas.* (Announcement.)
- Mines, Accidents in —; their causes and prevention. Alan Bagot. London. *Paul & Co.* (Announcement.)
- Mont Blanc: A treatise on its geodesical and geological constitution — its transformations, and the old and modern states of its Glaciers. Eugene Viollet-le-Duc. With 120 illustrations. Trans. by B. Bucknel. London. Demy 8vo. *Sampson, Low & Co.* 14s.
- Motion, Stability of a Given State of — particularly Steady Motion. Adams' Prize Essay for 1876. E. J. Routh. London. 8vo. *Macmillan & Co.* 8s. 6d.
- Mycenæ, Ancient; Discoveries and Researches on the Sites of Mycenæ and Tiryns. Dr. Schliemann, author of "Troy and its Remains." With Preface by the Right Hon. W. E. Gladstone, M.P. 500 Plans and Illustrations. London. 8vo. *John Murray.* (Announcement.)
- Naturalist, The Home; with Practical Instructions for Collecting, Arranging, and Preserving Natural Objects. Chiefly designed to assist Amateurs. Harland Coultas. New York. 12mo, illus. *Scribner, Welford & Armstrong.* \$1.75.
- Obelisks; a Short History of the Egyptian —. W. R. Cooper; with Translation of many of the Hieroglyphic Inscriptions, chiefly by Mr. Francis Chalas. London. Post 8vo. *Bagster.* 2s. 6d.
- Ocean, Thalassa; an Essay on the Depth, Temperature, and Currents of the —. John James Wild, Member of the Civilian Scientific Staff of H. M. S. *Challenger.* With Charts and Diagrams by the author. London. *M. Ward & Co.*
- Ornament, Owen Jones' Grammar of —. Illustrated by Examples from various Styles of Ornament. 112 Plates in gold and colors. New York. Imp. 4to. *R. Worthington.* \$30.00.
- Outlines; Reade's Second Grade Free Hand —. Being a Series of 24 Graduated Designs adapted to the Practice of Pupils preparing for the Examinations of the Science and Art Department, and other Junior Art Students. London. Sq. 16mo. *Simpkin.* 2s. 6d.
- Penmanship, Compendium of Ornamental —. D. T. Ames. With 46 Plates. New York. 4to. *Bicknell & Co.* \$5.00.

- Philosophy, Natural —. For Beginners. I. Todhunter. Part II.—Sound, Light, and Heat. New York. 18mo. *Macmillan & Co.* (Announcement.)
- Physics, Gault's Elementary Treatise on —. Experimental and Applied. Edited by E. Atkinson. 8th ed., revised and enlarged. London. Post 8vo. *Longmans*. 15s.
- Physiography, First Principles of —; What the World is and How it Works. Sydney B. J. Skertchley, of H. M. Geological Survey. With Illustrations. London. Crown 8vo, *Daldy, Isbister & Co.* (Announcement.)
- Plate, Old English —. Ecclesiastical, Decorative, and Domestic. Its makers and marks in London and Provincial Cities. Founded on papers and tables by Octavius S. Morgan. Wilfred J. Cripps. London. *John Murray*. (Announcement.)
- Prehistoric Europe; with Illustrations. James Geike of H. M. Geological Survey. London. *Daldy, Isbister & Co.* (Announcement.)
- Prices, Spone's Engineers' and Contractors' Illustrated Book of —, of Machines, Tools, Ironwork, and Contractors' Material, for 1877-'78. London. Royal 8vo. *Spons*. 7s. 6d.
- Pyramid, Our Inheritance in the Great —. Prof. Piazzi Smyth, Astronomer Royal for Scotland. 3d ed., rev. and enl. London. Post 8vo, illus. *Daldy, Isbister & Co.* 18s.
- Facts and Fancies. J. Bouwick. A Discussion of the various Theories, French as well as English, about the Great Pyramids. London. *Paul & Co.*
- Railways and Locomotives. A Series of Lectures delivered at the School of Military Engineering, Chatham, in the year 1877. Railways, by John Wolfe Barry; Locomotives, by F. J. Bramwell. London. *Longmans*. (Announcement.)
- Roads and Streets, the Construction of —. In 2 Parts: 1. The Art of Constructing Common Roads. Henry Law, C. E. Revised and condensed by D. Kinnear Clark, C. E. II. Recent Practice in the Construction of Roads and Streets; including Pavements of Stone, Wood, and Asphalt. D. Kinnear Clark, C. E. London. 12mo. *Lockwood, Crosby & Co.* 5s.
- Rome, The Catacombs; or, Ancient Cemeteries of —. With 24 Plates and Plans, showing their Construction, and the Fresco Paintings from Photographs taken with the light of Magnesium. John Henry Parker, C. B. London. 8vo. *Parker & Co.* 15s.
- The Tombs in and near —. With the Columbaria and the Painted Tombs on the Via Latina. 24 Plates in Photo-Engraving. Also Mythology in Funeral Sculpture and Early Christian Sculpture. 16 Plates. John Henry Parker C. B. London. 8vo, cloth. *Parker & Co.* 15s.
- Archaeology of —. Part 13. Early and Mediæval Castles, or Palaces and Gardens. With 16 Plates and Plans. Also a complete Account of the Excavations in Rome from 1860 to the present time. John Henry Parker, C. B. London. *Parker & Co.* (Announcement.)
- Sahara, The Flooding of the —. An Account of the great Project for opening Direct Communication with 38,000,000 People. With a Description of North-West Africa and Soudan. Donald McKenzie. With Illustrations. London. *Simpson, Low & Co.* (Announcement.)
- Sculpture, History of —, from the earliest Period to the Present Time. Dr. Wilhelm Lübke, Professor at Heidelberg. Translated by F. E. Bunnett. New ed. London. Imp. 8vo, illus. *Smith, Elder & Co.* 42s.
- Ships, Our Fighting —. Being a description of the Construction, Armor, and Fighting Power of Modern War Ships of England and other European Powers. By Mr. T. King, Special Naval Commissioner of the United States. With 20 full page Illustrations. Portsmouth. *Griffen & Co.* (Announcement.)
- Slates and Slate Quarrying, a Treatise on— Scientific, practical, and commercial. D. C. Davies, F.G.S. London. *Lockwood, Crosby & Co.* (Announcement.)
- Steam Engine, The.—A practical treatise. Arthur Rigg. With plates. London. 4to. *Spons*. (Announcement.)
- Telegraph Journal of the Society of—Engineers, including original communications on Telegraphy and Electrical Science. Published under the supervision of the Editing Committee, and edited by Lieut. Col. Frank Bolton, C.E., Hon. Secretary, and William Edward Langdon, Acting Secretary. Nos. 15 and 16. London. 8vo. *Spons*. 15s.
- Instructions for Testing— Lines, and the Technical Arrangements in Offices. Louis Schwendler. London. *Trubner & Co.* (Announcement.)
- Temple—The—of Jerusalem and the other Buildings in the Haram Area, from Solomon to Saladin.—James Fergusson. London. *John Murray*.
- Thermodynamics.—R. Wortwell. London Science Class Books. London. 18mo. *Longmans*. 1s. 6d.
- Topography, Aberdeen and the Northeast of Scotland.—A topographical sketch, with a map of the district. Aberdeen. 8vo. *Hamilton, London*. 1s.
- Tramways, Their Construction and Working —Comprising a comprehensive history of the system, with an analysis of the various modes of traction, including horse power, steam, heated water and compressed air; a description of the varieties of rolling stock, and details of cost and working expenses, with special reference to the tramways of the United Kingdom. D. Kinnear Clarke. With numerous wood engravings and 13 folding plates. London. *Lockwood, Crosby & Co.* (Announcement.)
- Universal Information, Beeton's Dictionary of—Science, Art, and Literature. Rev. and enl. 2 Vols. illus. London. *Ward, Lock & Co.* 21s.
- University Studies in England in the Eighteenth Century. By Christopher Wordsworth, M. A. London—*Cambridge Warehouse*. (Announcement.)
- Water Courses, A Treatise on the Law of —, with an Appendix containing Statutes of Flowing, and Forms of Declarations. Jos. K. Angell. Rev. and very much enl. by the addition of new matter to the Text and Notes, by J. C. Perkins, Esq. 7th ed. Boston. 8vo. *Little, Brown & Co.* \$6.00.
- Water Supply. Water Supply of South Africa, and Facilities for the Storage of it. J. C. Brown. Edinburgh. 8vo. (*Simpkin, London*.) 20s.
- Year Book of Facts in Science and the Arts. James Mason. London. *Ward, Lock & Co.* 2s. 6d.

ADDITIONS TO

LIBRARY AND MUSEUM.

From John W. Bacon, Danbury, Conn.:
Nineteenth, twenty-second, twenty-third and
twenty-fourth Annual Reports of the Rail-
road Commissioners of the State of Connecti-
cut, for 1872, 1875, 1876 and 1877. Hart-
ford.

From C. E. Billin, Philadelphia:
Annual Report of Secretary of Internal Affairs
of the State of Pennsylvania. Part III. In-
dustrial Statistics. Vol. IV. 1875-6. W.
Hayes Grier, Chief of Bureau. Wm. McCand-
less, Secretary of Int. Affairs.

Annual Report of Secretary of Internal Affairs,
State of Pennsylvania. Part IV. Railroad,
Canal, Navigation and Telegraph Companies
for year 1876. Wm. McCandless, Secretary,
Harrisburg.

From Robert Briggs, Philadelphia:
A Decimal Gauge for Sheet Metal and Wire.
Robert Briggs. (Reprinted from the Jour-
nal of the Franklin Institute for December,
1877.) Philadelphia. (Copies for Distribu-
tion.)

From E. S. Chesbrough, Chicago:
First Annual Report of the Department of
Public Works to the City Council of the City
of Chicago, for the fiscal year ending Dec-
ember 31, 1876. Chicago.

From J. J. R. Croes, New York:
Department of Public Pa'ks. Communica-
tion from the Landscape Architect and the
Civil and Topographical Engineer in relation
to proposed plan for laying out the Central
District of the 23d and 24th Wards, N. Y.
City. (Copies for Distribution.)

From J. W. Davis, New York:
Formule for Calculation of Railroad Excava-
tion and Embankment, and for finding
Average Haul. John Woodbridge Davis,
C. E. (Second thousand.) New York.

From A. Jay Du Bois, Bethlehem, Pa.:
Mechanics of Engineering and Construction
of Machines. Phil. Julius Weisbach. Vol.
II. Translated by A. Jay Du Bois. New
York.

From Charles D. Elliot, Somerville,
Mass.:

Census of Massachusetts, 1875. Vol. I. Pop-
ulation and Social Statistics; Vol. II. Manu-
factures and Occupations; Vol. III. Agri-
cultural Products and Property. Prepared
under direction of Carroll D. Wright. Bos-
ton.

Eighth Annual Report of the Bureau of Sta-
tistics of Labor. March, 1877. (Massachu-
setts.) Boston.

From Gen. A. A. Humphreys, Washing-
ton:
Report on Geological Surveys west of the
100th Meridian. First Lieutenant Geo. M.
Wheeler, U. S. Engineers, in charge. Vol.
IV., Paleontology. Part 1. Invertebrate
Fossils. Charles A. White, M. D.; Part 2.
Vertebrate Fossils. Prof. E. D. Cope. Wash-
ington.

From Institution of Civil Engineers,
London:

Excerpts from Minutes of Proceedings. Vol.
L. Session 1876-7. Part 4. Edited by
James Forrest, Secretary:

On Foundations. Translated from the
French of Jules Gaudard by L. F. Vernon
Harcourt.

On the Main Roads of South Australia.
Charles T. Hargrave.

The Design and Construction of the South
Reserve Piers and Floating Landing
Stage at Birkenhead. Charles Graham
Smith.

The Rajpootna (State) Railway. Horace Bell.
Abstracts of Papers in Foreign Transactions
and Periodicals.

From Institution of Mechanical Engi-
neers, London:
Proceedings of the Institution. July, 1877.
Bristol Meeting. London.

From Walter Katté, New York:
Plans of Structure N. Y. Elevated Railroad.
Walter Katté, Chief Engineer, -7 plates.

From North of England Institute of
Mining and Mechanical Engineers,
Newcastle-upon-Tyne:
Transactions of the Institute. Vol. XXVI.,
Part vii. Members' Names, Barometer
Readings, Council and Finance Reports,
&c. Newcastle-upon-Tyne, 1877.

Transactions of the Institute for August, 1877.
Cooke's Ventilating Machine, Proceedings,
Ventilation of Mines. Newcastle-upon-
Tyne, 1877.

From Portuguese Society of Civil Engi-
neers, Lisbon:
Review of the Public Documents from the
Table of the Society. Lisbon.

From F. Rinecker, Wurzburg, Germany:
Photographic Views of Mount Righi Railroad
and its Scenery. 15 photographs. Geneva.

From Royal United Service Institution,
London:
Journal of the Institution. Vol. XXI. No. 92.
1877. London.

From Society of Architects and Engi-
neers of Hanover, Hanover:
Journal of the Society. Edited by Professor
Keck. Published by the Directors. Vol.
XXIII. Part 4. 1877. Hanover.

From State Board of Geological Survey
of Michigan, Lansing, Mich.:
Geological Survey of Michigan, Lower Penin-
sula, 1873-1876, accompanied by a Geologi-
cal Map. Vol. III. Part 1, Geology; Part 2,
Paleontology, Corals. C. Rominger, State
Geologist. New York.

From Co. & Talcott, San Francisco:
Scenery on the Redwood Branch S. F. & N. P.
R. R. Lithograph. San Francisco.

From U. S. Coast Survey, Washington:
Report of Superintendent of the U. S. Coast
Survey, showing progress of Survey during
the year 1874. Washington, 1877.

From other sources:
Illustrations to accompany Annual Report of
the Commissioner of Patents for the year
1869. Vol. IV. Washington, 1876.
Annual Report of the Commissioner of Pa-
tents for the year 1871. Vol. III. Illus-
trations. Washington, 1876.

Catalogue of the University of Cincinnati for
academic year 1877-8. Cincinnati, 1877.

LIST OF MEMBERS.

ADDITIONS.

	Date of Election.
BROWN, CHARLES O.....(Junior to Member), Eng. Passaic Rolling Mill Co., 138 Chambers street, New York.....	Nov. 7, 1877.
CLARKE, FREDERICK W.....Ch. Eng. S. Chicago Pumping Works, Chicago, Ill.....	" "
COMPTON, ALFRED G. [A.]...Prof. Applied Math. College of City of New York, New York	Sept. 5, "
JOHNSON, THOMAS H.....Civil Eng., 64 North High street, Columbus, Ohio.....	" "
RAYMOND, CHARLES W. [J.]...Ass't Engineer, Department of Docks, New York.....	Nov. 7, "
WROTNOWSKI, ARTHUR F....Civil Eng., New Orleans, La.....	July 12, "

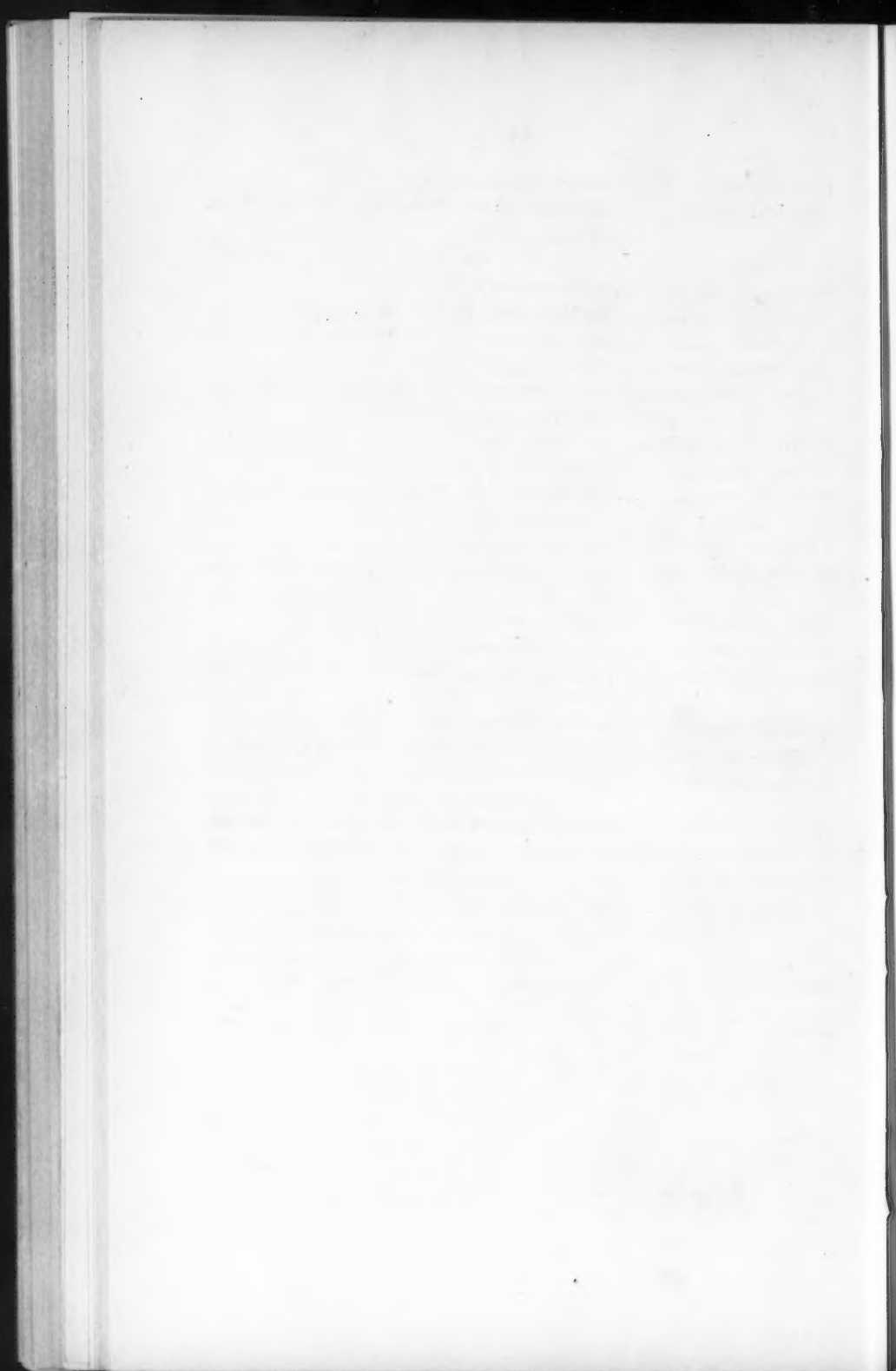
CHANGES AND CORRECTIONS.

ATKINSON, JOHN B.....	Sec. and Treas. St. Bernard Coal Co., Erlington, Ky.
BACON, JOHN W.....	Gen. Railroad Commissioner, State of Connecticut, Danbury, Conn.
BARNES, PHINEAS.....	Plainfield, N. J.
BAXTER, GEORGE S.....	Tarrytown, N. Y.
BLAND, JOHN C.....	265 South Fourth street, Philadelphia, Pa.
BOGART, JOHN.....	(Secretary) Am. Soc. Civil Engineers, 104 East Twentieth street, New York.
BROOKS, FREDERICK.....	13 Boylston street, Boston, Mass.
BULLOCK, W. D.....	Box 262, Pawtucket, R. I.
CLARKE, H. WADSWORTH....	Ch. Eng. Resurvey New York and Pennsylvania, Syracuse, N. Y.
COLLINGWOOD, FRANCIS....	Ass't Eng. N. Y. & B. Bridge, cor. Cherry and Pearl streets, New York..
DRESSER, G. W.....	Editor Am. Gas-Light Journal and Chemical Reporter, 44 East Twenty-fifth street, New York.
DUN, JAMES.....	Ch. Eng. St. L. & S. F. R. R., North Springfield, Mo.
HALL, G. THOMAS.....	Ass't Eng. Gilbert Elev. R. R., 71 Broadway, New York.

- HOUSTON, JOHN.....Box 145, Hackensack, N. J.
- JONES, WASHINGTON.....Port Richmond Iron Works, 1,057 Richmond street,
Philadelphia, Pa.
- KATTE, WALTER.....Ch. Eng. N. Y. Elev. R. R., 7 Broadway, New York.
- KINSLEY, THOMAS P.407 Putnam avenue, Brooklyn, N. Y.
- LEVERICH, G.265 Macon street, Brooklyn, N. Y.
- LOTZ, WM. H.Mech. and Cons. Eng., 93 Fifth avenue, Chicago, Ill.
- MACRITCHIE, CHARLES.....169 La Salle street, Chicago, Ill.
- MASTEN, CORNELIUS S.....Haven & Masten Mfg. Co., 30 Phelps ave., Rochester,
N. Y.
- NEWTON, WILLIAM H.....595 Division street, Chicago, Ill.
- PONTZEN, ERNEST.....43 Rue Neuve des Mathurins, Paris, France.
- PROUT, HENRY G.Care Am. Soc. Civil Engineers, 104 East Twentieth
street, New York.
- RAYNOLDS, JAMES D.....Riverside, Cook Co., Ill.
- ROBERTS, W. MILNOR.....(Vice-President) Ch. Eng. N. P. R. R., 23 Fifth ave.,
New York.
- SEARS, ALFRED F.....Chimbote, Peru.
- SEDGWICK, THOMAS S.....1,016 Walnut street, Philadelphia, Pa.
- SMITH, C. VANDERVOORT... (Director) Ch. Eng. Manhattan Gas-Light Co., New
York
- SOULE, HOWARD.....Civ. Eng., Syracuse, N. Y.
- TASKER, CHARLES A.....Res. Eng. C. S. Ry., 70 West Third st., Cincinnati, O.
- TOWLE, STEVENSON.....Eng. in charge Sewers, Dept. Public Works, 132 East
Seventieth street, New York.
- TURNER, EDMUND.....Eng. Road Dept. L. C. & S. W. R. R., Frankfort, Ind.
- VAN BUREN, ROBERT.....Ch. Eng. Dept. City Works, City Hall, Brooklyn, N. Y.
- WEEKS, HARVEY R.....Div. Eng. C. S. Ry., Butlerville, Ind.
- WELLMAN, DAVID W.....Ass't Eng. U. S. Imp. A. & W. Rivers, Fort Smith, Ark.

RESIGNED.

- DODGE, RICHARD D.....Brooklyn, N. Y.....Nov. 7, 1877.



American Society of Civil Engineers.

PROCEEDINGS.

Vol. III, December, 1877.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

NOVEMBER 21ST, 1877.—The Society met at 8 p. m. The paper entitled "Notes and Experiments on the Use and Testing of Portland Cement," by W. W. Maclay, for which the Norman Medal was awarded, was read and discussed.

DECEMBER 5TH, 1877.—The meeting was held at 8 p. m. The diploma and bronze medal awarded to the Society by the authorities of the Centennial International Exhibition were presented.

A donation by Moncure Robinson, honorary member of the Society, was also presented, with an accompanying letter. The donation was a portfolio of the original drawings of the first construction of the Reading Railroad, with descriptive pamphlets. Vice-President Roberts, in presenting the letter of Mr. Robinson, made remarks in special reference to a locomotive spoken of in that letter; and the subject of early locomotives was discussed. The thanks of the Society were tendered to Mr. Moncure Robinson.

A paper by D. McN. Stauffer, member of the Society, describing a peculiar case of failure in a water main, was read and discussed.

It was determined that the Library of the Society should be opened on Thursday evenings, from 7½ to 10 p. m., during December, January, and February next, and that a record of members present on those evenings should be kept. The standing committees for the year were announced.

DECEMBER 19TH, 1877.—The meeting was held at 8 P. M. Donations of valuable books and documents, made to the Society by Mr. T. S. Sedgwick and by Mr. Edward A. Flint, were presented, and the thanks of the Society were directed to be tendered to each of the donors.

A paper by Charles Latimer, describing a graphic method of representing railroad accounts, was read, and an accompanying chart presented. Discussion on the subject followed.

The piece of pipe was exhibited containing the fracture referred to in the paper by D. McN. Stauffer, read at the last meeting, and discussion followed as to the probable cause of the fracture.

OF THE BOARD OF DIRECTION.

NOVEMBER 14TH, 1877.—The Board met, and the following Standing Committees were appointed:

On Finance: George S. Greene, William H. Paine and C. Vandervoort Smith.

On Library: W. Milnor Roberts, J. J. R. Croes, and Albert Fink.

Applications for membership were considered and other routine business transacted.

DECEMBER 5TH, 1877.—The Board met and considered applications for membership and other routine business.

LIST OF NEW BOOKS ON

ENGINEERING AND TECHNOLOGY.

Under this head will be announced new books on these and kindred subjects, which may be professionally useful to members of the Society.

Architecture, Interior.—E. Daubourg. London. Folio. *Chapman & Hall*. 52s. 6d.

—Early New England Interiors. Sketches in Salem, Marblehead, Portsmouth and Kittery. Arthur Little. Boston. Obl. folio. *A. Williams & Co.* \$6.00.

—Historic Mansions and Buildings of Philadelphia, with some notices of their Owners and Occupants. Thompson Westcott. Philadelphia. 4to. *Porter & Coates*. \$5.00.

—The Stately Homes of England. L. Jewitt and S. C. Hall. 2d Series. Philadelphia. Square 8vo. *Gebbie & Barrie*. \$7.50.

—Bicknell, Series on—, A. J. Bicknell. New York. 4to. *A. J. Bicknell & Co.*
Cottage and Villa Architecture. \$6.00.
Street, Store and Bank Fronts. \$4.00.
Public Buildings. \$3.50.
School House and Church Architecture. \$3.00.

—Stables, Out Buildings, Fences and Miscellaneous Details. \$2.50.

—Rudiments of the Art of Building. E. Dodson. 10th ed. (Weale's Series). London. 12mo. *Lockwood*. 2s.

—Education applied to Industry. George Ward Nichols. New York. 8vo, illus. *Harpers*. \$4.00.

—Flaxman's Outline Designs. Used in the Greek and other schoolsof Decorative—First Series of 20 designs. In a portfolio. Boston. *Tilton & Co.* \$1.00.

—Studies in Ornamental—, as applied to the Decoration of Pottery. First Series. Part I.—Greek Ornament. Boston. *Tilton & Co.* \$1.00.

—The House Beautiful. Essays on Beds, Tables, Stools and Candlesticks. Clarence Cook. New York. 4to, illus. *Scribner, Armstrong & Co.* \$7.50.

Astronomy, Annals of the Astronomical Observatory of Harvard College. Vol. VIII. Results of Observations made or directed by William Cranch Bond, A.M., George Phillips Bond, A.M., and Joseph Winlock, A.M. Part I. Historical Account of the Observatory from October, 1853, to October, 1876. Part II. Astronomical Engravings of the Moon, Planets, &c. Astronomical Engravings illustrating Solar Phenomena. 51 plates. Boston. 4to, illus. *Ginn & Heath*. \$10.00.

- Builder, The Immigrant—**: showing how to place and construct dwellings in the bush, on the prairie, or elsewhere, cheaply and well, with wood, earth, or gravel. C. P. Dwyer. Philadelphia. 8vo, illus. *Claxton, Remsen & Haefelfinger*. \$1.50.
- Cement, Science and Art of the Manufacture of Portland—**, with Observations on some of its Constructive Applications. H. Reid. London. 8vo. *Spons*. 18s.
- Centennial Exhibition, Gems of the —** — Consist. of illus. descriptions of Objects of an Artistic Character in the Exhibits of the U. S., Great Britain, France, Spain, Italy, Germany, Belgium, Norway, Sweden, Denmark, Hungary, Russia, &c. New York. 4to, illus. *Appletons*. \$6.00.
- **Photographic Souvenir of the —** — A series of four quarto portfolios, containing a choice collection of photographs of objects of interest in the Exhibition. Four series. No. 1, first series, \$20; No. 2, first series, \$15; No. 1, second series, \$10; No. 2, second series, \$7.50. Philadelphia. *Lippincott*.
- **Treasures of Art, Industry, and Manufacture, as represented at the —** —, 1876 C. B. Norton. 40 plates, with letterpress in English and French. Large folio, half turkey, full gilt. Philadelphia. *S. T. Souder*. \$50.00.
- Cyprus; Its Ancient Cities, Tombs, and Temples. A Narrative of Researches and Excavations during Ten Years Residence in that Island.** Gen. L. P. di Cesnola. New York. 8vo. Maps and illus. *Harpers*. \$7.50.
- **Its Ancient Cities, Tombs, and Temples. A Narrative of Researches and Excavations during Ten Years' Residence as American Consul in that Island.** Gen. L. P. di Cesnola. London. 8vo. Maps and illus. *Murray*. 50s.
- Drawing. Linear, Perspective, and Model —** — A School and Art Class Manual. Laurence Anderson. London. Royal 8vo. *Macmillan*. 2s.
- Engineering. Instruction in Military —** — Vol. 1, part 3. Military Bridges. Compiled at the School of Military Engineering, Chatham. London. Post 8vo. *Government Publication*. 3s.
- Fat and Blood, and how to make them.** S. W. Mitchell, M. D. Rev. ed. Philadelphia. 12 mo. *Lippincott*. \$1.25.
- Geology. Memoirs of the Geological Survey of the United Kingdom. Monograph 3. The Crocodilian Remains found in the Elgin Sandstones. With remarks on the Ichneutes of Cunningham.** Thomas H. Huxley. London. 8vo. Plates. *Government Publication*. 14s. 6d.
- Hygiene. Public —** in America; being the Centennial Discourse delivered before the International Medical Congress, Phila., Sept., 1876. Henry I. Bowditch, M.D. With extracts from correspondence from various States. Together with a Digest of American Sanitary Laws. H. G. Pickering. Boston. Crown 8vo. *Little, Brown & Co.* \$2.50.
- Labor. The —** problem in the United States, with an Introduction by Thurlow Weed. New York. *Athenaeum Pub. Co.* (Announcement.)
- Metric System. Easy Steps in the —** — for Elementary Subjects. With Answers. G. Gill. London. 18mo. *Kempster*. 2d.
- Microscope. The —** Andrew Ross. New York. 12mo. *Industrial Pub. Co.* \$0.75.
- Mycenæ. A Narrative of Researches and Discoveries at —** and Tiryns. By Dr. Henry Schliemann. With a Preface by the Right Hon. W. E. Gladstone, M. P. With plans, views, and cuts, representing more than 700 types of the objects found in the Royal Sepulchres of Mycenæ, and elsewhere in the excavations. New York. 4to, illus. *Scribner, Armstrong & Co.* \$12.00.
- Nile. A Thousand Miles up the —** Being a Journey through Egypt and Nubia to the Second Cataract. With fac-similes of inscriptions, ground plans, two colored maps of the Nile from Alexandria to Dongola, and 80 ills. eng. A. B. Edwards. New York. Imp. 8vo, illus. *Scribner, Welford & Armstrong*. \$12.00.
- Ordinance. Abridged Treatise on the Construction and Manufacture of —** in the British Service. Prepared in the Royal Gun Factory. Printed by order of the Secretary of State for War. July, 1877. London. 8vo. *Government Publication*. 6s.
- Painting. The Art of House —** being a Record of the Observations and Experiences during many Years of a Practical Worker in the Art. Designed to instruct and assist in the Every-day Work of Painters and others. John Stevens. New York. 18mo. *Wiley & Son*. \$0.75.
- Patents. Law of —** Trade-Marks, and Copyrights, with Notes under each Section of the Law referring to the Decisions of the Courts and the Commissioners of Patents, together with the Rules of Practice in the U. S. Patent Office and a large Collection of Forms. O. F. Bump. New York. 8vo. *Baker, Voorhies & Co.* \$6.00.
- Physics. Ganot's —** Elem. Treatise on — Experimental and Applied. Tr. and ed. from Ganot's Elements de Physique. By E. Atkinson, Ph. D. Philadelphia. 12 mo, illus. *Wood*. \$5.00.
- Pottery and Porcelain of all Times and Nations. With Tables of Factory and Artists' Marks, for the use of Collectors.** William C. Prime. New York. 8vo illus. *Harpers*. \$7.00.
- **From early Times down to the Phila. Exhibition of 1876.** By Chas. Wyllys Elliott. With 165 illus., and the more important marks and monograms. New York. 8q. 8vo, illus. *Appleton*. \$5.00.
- Quantities—A Text-book for surveyors in Tabulated Form, explanatory of the Best Methods adopted in Measurement of Builders' Work, and containing useful Hints and Valuable Information for the Surveyor, also Tables of the various Trades and for the Measurement and Valuation of different Materials. Tables of Constants for the Valuation of Labor, Comparative Tables of Different Countries, &c., and a Complete Index.** Banister Fletcher. London. Post 8vo, illus. *Batsford*. 6s.
- Sanitary Engineering. A Guide to the Construction of Works of Sewerage and House Drainage, with Tables for facilitating Calculations of the Engineer; to which is added Specimen Copy of Proposals for Estimates and Specifications for the Construction of a Sewer in New York City; also, a Paper on the Planning and Building of Sewers, translated for this work. B. Latham. Small folio; many plates. Chicago, 1877. \$3.00.**
- Science and Literature in the Middle Ages.** By Paul Lacroix. Illus. with 15 chromoliths, and 250 wood engs. New York. 4to. *Appleton*. \$12.00.

—, —, —, XVIII^eme Siecle. Lettres, Industrie, Sciences et Arts. France, 1790-1798. By Paul Lacroix. illus. with 15 chromo-liths. and 250 wood engravings. Paris. Imp. 8vo. *Bouton, New York.* \$13.50.
 Silver Country, The — or, The Great Southwest. A Review of the Mineral and other Wealth, the Attractions and Material Development of the former Kingdom of New Spain, comprising Mexico and the Mexican Cessions to the U. S. in 1848 and 1853. Alex. D. Anderson. *New York.* 12mo. map. *Putnam.* \$1.75.
 Steam. An Elementary Treatise on — and the Use of the Indicator. J. C. Graham. *New York.* 8vo, illus. *Spons.* \$3.50.

Titles to Real Estate in the State of New York. Jas. W. Gerard. 2d ed. *New York.* 8vo. *Baker, Voorhees & Co.* \$6.50.
 Townships. Township and Town Officers' Guide; a Summary of the Law Governing Towns and Townships in the State of Indiana. With Instructions and Forms. Francis Adkinson. Cincinnati. 12mo. *R. Clarke & Co.* \$2.00.
 Ventilation. Mechanics of —. Geo. W. Rafter, C. E. (Van Nostrand's Science Series, No. 33). *New York.* 18mo. *Van Nostrand.* \$0.50.
 Voyages. Recent Polar —. From the Search after Franklin to the Polar Expedition, 1875-1876. *New York.* Crown 8vo, illus. *Thomas Nelson & Sons.* \$2.50.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Edward A. Flint, Boston :
 Annual of Scientific Discovery. D. A. Wells. *Boston.* 1862.
 Canada and her Resources. An Essay by Alexander Morris, A. M. 1855.
 Canada; an Essay. J. Sheridan Hogan. *Montreal.* 1855.
 Report of the Southern R. R. of Canada. William Scott, C. E. 1855.
 Great Southern Railroad, Canada. Letter to Railway Committee, R. G. Bennett, Chief Engineer. 1855.
 Charter and Amendments of Northern Pacific Railroad. Approved July 2d, 1864. (5 copies.)
 Descriptions des Procédés Métallurgiques employés dans le pays de galles pour la Fabrication du Cuivre. M. F. Le Play. *Paris.* 1848.
 Exploration; British North America. Index and Maps to Capt. Palliser's Reports. *London.* 1865.
 Exploration; British North America. The Journals, Detailed Reports, and Observations. 1857-8-9-1860. Capt. Palliser. *London.* 1863.
 Dictionary of Mechanics, Vol. II. O. Byrne. *New York.* 1851.
 Civil Engineering. D. H. Mahan. *New York.* 1837.
 Coast of Egypt. Suez Canal. Henry Mitchell, A. M. *Boston.* 1869.
 Economy of Fuel and Consumption of Smoke as effected by Amory's Improved Patent Furnace. S. Kneeland. 1876.
 American Engineers, Instruments. Gurley. *Troy.* 1869. (2 copies.)
 Exploring expedition. Assiniboine and Saskatchewan, Canada. Reports of Progress and general report. H. Y. Hind. *London.* 1860.
 Report of Col. W. F. Reynolds on Exploration of the Yellowstone. (2 copies).
 Sitgreaves, Expedition—Zurri and Colorado Rivers. Capt. Evans, Topo. Engr., U. S. A. 1854.
 Results of Experimental Trials of the American Anti-Incrustator. Charles M. Cresson, M. D. *Philadelphia.* 1867.

Iron, Cast and Wrought. Fairbairn, 1854.
 Iron Manufacturers' Guide. Lesley. *New York.* 1859.
 Atlas of Engravings to Treatise on Locomotive Engines. C. D. Dempsey, C. E. *London.* 1856.
 Louisiana, Acts passed by Sixth Legislature. 1861.
 Métaux précieux au Mexique. S. C. Dupoit. *Paris.* 1843.
 Mineral Resources of the United States. Report by J. R. Brown and J. W. Taylor, 1867.
 Metallic Wealth of the United States. Whitney. *Philadelphia.* 1854.
 Maps and views to accompany documents and messages. 1855-6.
 Physics and Hydraulics of the Mississippi. Humphreys and Abbots. 1867.
 President's Message and Documents, 1857-58.
 Pacific Railroad Explorations, Surveys and Reports.
 Report on Route near the 47th and 49th parallel (Northern) from St. Paul to Puget. Part 1. Isaac J. Stevens. 1855.
 Report on Route near the 47th and 49th parallel (Northern) from St. Paul to Puget. Part 2. Isaac J. Stevens. 1855.
 Report on Route near the 35th parallel by Lt. A. W. Whipple, Topo. Engr., U. S. A. 1856.
 Report on Route near the 35th parallel, by Lt. A. W. Whipple, Topo. Engr., U. S. A. 1856. Part 2.
 Report on routes in California to connect with those near the 32d and 35th parallels, by Lt. R. S. Williamson, Topo. Eng., U. S. A. 1856.
 Report by Lt. Henry L. Abbot, Topo. Eng., U. S. A., upon routes in Oregon and California. 1857.
 Memoir of Lt. G. K. Warren, Topo. Eng., U. S. A., upon materials and methods compiling general maps, also contains Topographical maps, &c. 1855.
 Report on routes in California to connect with those near the 32d and 35th parallel, by Lt. John G. Parke, Topo. Eng., U. S. A.; also official review of reports by Capt. A. A. Humphreys, Topo. Eng., U. S. A. 1857.
 Railroad to the Pacific—Northern Route. E. F. Johnson. 1854.

Northern Pacific Railroad—Report of E. F. Johnson, Chief Engineer. November, 1867.
 Special Report of a Reconnaissance of the route for the Northern Pacific Railroad, between Lake Superior and Puget Sound via Columbia River. W. Milnor Roberts. Philadelphia, 1869.
 Resolution authorizing Northern Pacific Railroad Company to issue bonds for its construction. (5 copies.)
 Map of the proposed Route, Northern Pacific Railroad.
 Second Annual Report of Railroad Commissioners of Massachusetts. Boston, 1871.
 Third Annual Report of Railroad Commissioners of Massachusetts. Boston, 1872.
 The Government and Railroad Corporations. Charles F. Adams, Jr. Boston, 1871.
 Annual Report of the Railroad Commissioners of New York, 1855.
 Report of Directors of Vermont and Massachusetts Railroad, 1851.
 Railway Gauges. Silas Seymour. 1871.
 Informe relativo a los negocios de la Compania Ferro Carril de Copiapo durante el Primer Semestre. Valpariso, 1865.
 Improvements in Railroad Machinery. C. Cammell & Co.
 Railway Property. John B. Jervis. Philadelphia, 1869.
 Extracts and Articles on Steel Rails. New York. 1868.
 Street Railways. Easton. Philadelphia. 1859.
 Map of Railways of Great Britain, with profiles.
 St. Louis Bridge. Proceedings and Report of Board of Civil Engineers. August, 1867.
 San Francisco Harbor Commissioners. Report of Thaddeus R. Brooks, C. E. 1866.
 Report of Surveyor General of California. 1869.
 The Chicago Lake Tunnel. Chicago. 1867.
 Wilmington Harbor, California. Report and Map. By Gen. B. S. Alexander, U. S. Engineers.
 United States Naval Astronomical Exploration to the Southern Hemisphere :
 Vol. I.—Chile. 2 copies.
 Vol. II.—The Andes and Pampas. Lt. A. McRae.
 —Minerals. J. Lawrence Smith.
 —Indian Remains. Thomas Enbark.
 —Mammals. S. F. Baird.
 —Birds. John Cassin.
 —Reptiles, Fishes and Crustacea. Charles Gerard.
 —Shells. A. A. Gould.
 —Dried Plants. Asa Gray.
 —Living Plants and Seeds. W. D. Breckenridge.
 —Fossil Mammals. J. Wyman.
 —do. Shells. T. A. Conrad.
 Vol. III.—Observations to determine the Solar Parallax. Lieut. J. M. Gilliss.
 From Moncure Robinson, Philadelphia:
 Twenty-four original plans of the first construction of the Philadelphia and Reading Railroad.
 Report in reference to the performance at the first trial of the Locomotive "Gowan and Marx," on the P. & R. R., December, 1839. Philadelphia. 1839.
 Report in reference to the same Locomotive in February, 1840. Philadelphia. 1840.
 Address before the Franklin Institute. By R. E. Rogers. February, 1840. With appendix of references to the Locomotive "Gowan and Marx."

From Thomas S. Sedgwick, Philadelphia:
 Report, Department of Agriculture. Horace Capron. 1868.
 Cambridge Astronomy. John Farrar. Boston. 1834.
 Annual of Scientific Discovery for 1869. Sam. Kneeland. Boston.
 Report of Chief Engineer, Illinois and St. Louis Bridge Co., Jas. B. Eads. 1868-70-71.
 Report of State Engineer on Canals of New York. 1864.
 Annual Report of the State Engineer and Surveyor on the Canals of New York. Jan. 13th, 1871.
 Annual Report of the State Engineer and Surveyor on the Canals of New York. Jan. 13th, 1873.
 Report of the Auditor on Tolls, Trade and Tonnage of the Canals of New York. 1872.
 Chesapeake and Ohio, and Ohio and Lake Erie Canals. Jas. Shriver. Baltimore. 1824.
 Reports upon Chesapeake and Ohio Canal. 1826.
 Ohio Canal Documents. (The Civil Engineer Newspaper. Columbus, Ohio.) 1828.
 Reports and Letters from the Engineers employed in the Revised Location of the Western Section of the Chesapeake and Ohio Canal, with estimates and cost of the same. Benj. Wright. 1829.
 Report to the Stockholders of Chesapeake and Ohio Canal to Cumberland, with a sketch of the Potomac Country. Feb. 27, 1851. Washington.
 Coast Pilot of California, Oregon, Washington Territory. U. S. Coast Survey. G. Davidson. 1869.
 Report of the Chief of Engineers U. S. A. 1871.
 Report of the Chief of Engineers U. S. A. Part I. 1876.
 Report of the Chief of Engineers U. S. A. Part II. 1876. (Improvement of Ohio River.)
 Report of Chief of Engineers U. S. A. Part III. 1876.
 Improvement in Machinery for Manipulating Materials in Gas Manufacture. Thomas F. Rowland. 1873.
 Geological Survey of Ohio. 1870. J. S. Newberry. Maps showing Geological Survey of Ohio.
 Geological Survey of Pennsylvania. 1874 :
 Report of Progress on Brown Hematite Ore Ranges of Lehigh County. Fred. Prime, Jr.
 Second Geological Survey of Pennsylvania. 1874. Preliminary report on Mineralogy of Pennsylvania, by F. A. Genth.
 Second Geological Survey of Pennsylvania. 1875. Report of Counties York, Adams, Cumberland, and Franklin. Persifer Frazer.
 Second Geological Survey of Pennsylvania. 1874-5-6.
 Historical Sketch of Geological Explorations in Pennsylvania and other States. J. P. Lesley.
 Geological Survey of Pennsylvania. 1875 :
 Report of Progress in the Cambria and Somerset District. F. & W. G. Platt.
 Report of Progress in the Laboratory of the Survey at Harrisburgh, 1874-5. Andrew S. McGrath.

- Contributions to Physical Geography of the United States, by Charles Allen, and Report of Progress of Levels of Pennsylvania, 1776. By J. F. Lesley. (2 copies.) Report of Progress in the Greene and Washington District.
- Special Report on Petroleum of Pennsylvania, 1874. By H. E. Wrigley.
- Report of Venango Co. District, 1874. John F. Carrl.
- Report of Progress in Jefferson and Clearfield District. F. Platt.
- Geology of the Uinta Mountains, 1876. Maj. J. W. Powell.
- Special Report on Immigration, with tables of average wages in 1869-70. Edward Young.
- Iron ore from West Virginia. (Scamena.)
- Memoir upon Illumination and Beaconage of the Coasts of France. By Leonce Reynaud. Translated by Maj. P. C. Hains, Corps of Engineers, U. S. A. 1876.
- Memoir upon the Lighthouse Illumination of the Coasts of France. Leonce Reynaud. Translated by Admiral T. A. Jenkins. Washington, 1871.
- Plates of Memoir on Lighting of the Coast of France.
- Report of a tour of Inspection of European Lighthouse Establishments made in 1873. Maj. G. H. Elliot. Washington, 1874.
- Report of the U. S. Lighthouse Board for 1876.
- Land Office Report for 1863.
- — — Report for 1876. (2 copies.)
- Cost of Labor and Subsistence in the United States, 1869. Edward Young.
- Lecture on Lenses. Jos. Zentmayer, Franklin Institute. 18 6.
- Survey of the Mouth of the Mississippi. H. G. Wright.
- Description of a Skeleton of the Mastodon Giganteus of North America.
- Mineral Resources of the States and Territories West of the Rocky Mountains. J. Ross Browne. 1867.
- Mineral Resources of the States and Territories West of the Rocky Mountains. J. Ross Browne. 1868.
- Report of R. W. Raymond on the Mineral Resources of the States and Territories West of the Rocky Mountains. 1869.
- Explorations and Surveys for Pacific R. R. G. K. Wren, U. S. Engineers. 1853-6.
- Report made to the President and Executive Board of Texas Pacific R. R. G. P. Buel. 1871.
- First Annual Report of the Board of Commissioners of the Department Public Parks. New York. 1871.
- Excelsior Pavement. G. Leverich. 1871.
- State Engineer's Report on Railroads of New York. 1868.
- State Engineer's Report on Railroads of New York. 1873.
- Statistical, and other facts relating to Narrow Gauge Railways. S. W. Dorsey. New York. 1871.
- Expediency of building Small Gauge Railroads in America. Maj. A. F. Sears. 1871.
- A Letter on the Railway Gauge System, B. H. Latrobe, with extracts from Reports of English Engineers. W. W. Evans. 1872.
- Proceedings National Railroad Convention, at St. Louis. 1875.
- Reports of Surveys and Examinations. Wolf Lake Cut, Indiana, Sebawing River, Mouth of Saginaw River, and Grand Marais Harbor.
- Reports of Examination and Surveys of certain rivers and harbors.
- Report of Maj. W. P. Craigbill on Examination and Cost of Construction of the Subdivision of the Central Transportation Route. 1875.
- Report of Maj. J. M. Wilson, on Examination and Cost of Construction of the Third Subdivision of the Northern Transportation Route. 1875.
- Reports of miscellaneous Surveys. Vols. I. and II. 1839.
- Instructions to Surveyors General of Public Lands. Washington. 1871.
- Sta'en Island Improvement Commission. 1871.
- Smithsonian Report. 1868.
- Smithsonian Report. 1870.
- Annual Report of the Chief of Bureau of Statistics: Commerce, Navigation of the United States. 1873.
- Report of Engineer J. W. Adams to Sewerage Commissioners, City of Brooklyn. 1859.
- Siemens' Regenerative Gas Furnaces. London. 1871.
- John Stevenson's Prices and Styles Street Railway Cars.
- Report of Explorations and Surveys for a Ship Canal, Isthmus of Tehuantepec. R. W. Shufeldt, U. S. N.
- Sutro Tunnel, Nevada. A. Sutro. 1868.
- Determination of the Astronomical Azimuth of a Direction. U. S. Coast Survey. C. A. Schott.
- Reports of Observations on the Total Eclipse of the Sun, August 7th, 1869. U. S. Coast Survey. 1869. (2 copies.)
- Formulae, Tables, and Examples, for the Geodetic Computation of Latitude, Longitude, and Azimuth of Trigonometrical Points, as used in U. S. Coast Survey.
- Determination of the Astronomical Latitude of a Station, by means of the Zenith Telescope. U. S. Coast Survey. C. A. Schott.
- Results of Experiments for determining Length of Six Metre Standard Bars. U. S. Coast Survey. Julius E. Hilgard.
- On the Moon's Mass as deduced from a Discussion of the Tides of Boston Harbor. U. S. Coast Survey. 1870. Wm. Ferrel.
- Treatise on the Plain Table and its Use in Topographical Surveying. U. S. Coast Survey. 1865.
- Use of Railways for Geodetic Surveys. U. S. Coast Survey. J. E. Hilgard. 1867.
- On the Use of the Telescope for observations of time. U. S. Coast Survey. J. E. Hilgard. 1869.
- Reports of Tides and Currents of Hell Gate. U. S. Coast Survey. Henry Mitchell. 1869.
- Report of Meteorological Effects on Tides from Observations by Prof. Wm. Ferrel. U. S. Coast Survey. 1871.
- Reclamation of Tide Lands and its relation to Navigation. U. S. Coast Survey. Henry Mitchell. 1869.
- On the Determination of Time by Transit Instruments, and on Astronomical Azimuth of a Direction. U. S. Coast Survey. C. A. Schott. 1868.
- Determination of Time by means of the Transit Instrument. U. S. Coast Survey. C. A. Schott.
- Discussion of Tides in Boston Harbor. U. S. Coast Survey. Wm. Ferrel. 1868.

Memoranda relating to the field-work of the Secondary Triangulation. U. S. Coast Survey. R. D. Cutts. 1868.
 Reports of Superintendent of U. S. Coast Survey. T. A. Jenkins. For years 1866, '69, '71, '72, '73.
 Reports of the U. S. Commissioners to the International Exhibition at Vienna, 1873. Vols. 1, 2, 3, 4. Ed. by R. H. Thurston. Washington. 1876.

Forbes' Volunteers' Manual. Vol. 1. New York. 1855.
 Report and Documents on the present state and the improvement of Washington City Canal. Cluss and Kammerhuerber. 1865.
 New Bedford Water Works. Specifications for Cast Iron and Cement Lined Pipes. Hydrants and Gates.
 Modern War. Its theory and practice.

ANNOUNCEMENTS.

THE ATTENTION OF MEMBERS IS EXPRESSLY called to the following resolution, passed after the reading of the paper published in the present number of Transactions.

Whereas, It has appeared in the discussion of the paper on cements, contributed by W. W. Maclay, that other members of the Society have data bearing on this subject, which is valuable and interesting, but which they may deem hardly extensive enough to form the subject of separate papers, and whereas, there is, doubtless, a large amount of such information in the possession of individual members of the Society;

Therefore Resolved, That the members of the Society be requested to communicate to the Secretary any unpublished information they may have on the subject of cements which they are willing to make public, the same to be edited by the Secretary and published by him in a single paper.

IN TRANSMITTING LETTER BALLOTS members of the Society are requested to conform in all respects with the printed regulations issued with the ballots. These regulations are frequently not complied with. Ballots are received without the signature of the member on the outer envelope, with initials instead of full signature or with other irregularities. When laid before the Society such irregular ballots have been thrown out and members sending them have lost their votes. The regulations seem to be as simple as possible to secure a fair secret ballot.

ILLUSTRATIONS OF PAPERS presented for publication should be distinctly drawn in broad, sharp lines, upon white, smooth (not "egg" or enamelled) paper, with perfectly (not glossy, or gray) black ink, to a scale twice or thrice greater than the print is to be; which in no case should require folding in more than one direction (i. e., the depth of plate, as inserted in Transactions, should not exceed 7 inches). Shades are to be produced by variations in size and spacing of black lines; no brush work or colors are admissible. Unless figures and letters can be well put in, simply pencil them, leaving the engraver to insert them on the plate. Always put a lineal scale upon each drawing.

MEMBERS OF THE SOCIETY are requested to contribute papers on Engineering subjects, giving results of practice, or discussing pertinent theoretical questions; their comments upon papers published in Transactions are solicited, and they are urged to contribute from note-books and other records whatever may bear upon the subjects considered, or upon other practical topics. A list of subjects relating to the practice of engineering and its connection with kindred art and public affairs, on which papers are desired, may be found on page 51, vol. 1.

DONATIONS TO THE LIBRARY. —Members and others are asked to contribute regularly to the library of the Society, copies of government, municipal, railway, canal and other reports, specifications, profiles, maps, photographs and like matter, making up the record of engineering operations for the past or present, and to inform the Secretary where such may be had. Duplicate copies are desired, for transmission to foreign societies in return for works collected and sent to this library by them; also for exchange with members and others who wish complete sets referring to particular subjects. Donations of old or new reports or pamphlets which refer to or illustrate Engineering constructions or operations are particularly solicited. Many of these may be really of great importance as a part of the Library, and as possibly containing information which might not otherwise be preserved.

THE ROOMS OF THE SOCIETY are at 104 East Twentieth street, one door east from Fourth avenue, and near southwest corner of Gramercy Park. They are open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when they are closed at 3 o'clock P. M.

The Library and Conversation Room will also, for the present, be open every Thursday evening, from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Thursday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBER.

Date of Election.

STEPHENS, CLINTON F.....Chief Engineer Dallas & Wichita R.
R., Dallas, Texas.....Sept, 5th, 1877.

CHANGES AND CORRECTIONS.

MEMBERS.

ANDERSON, ADNA.....Gen. Manager Paducah & Elizabethtown R. R.,
Elizabethtown, Ky.
CLARKE, H. WADSWORTH..Engineer in charge Re-survey of Boundary between
New York and Pennsylvania, Syracuse, N. Y.
EARLEY, JOHN E.....College Hill, Mass.
GODWIN, BRYANT.....53 North Pearl Street, Albany, N. Y.
HORTON, SANFORD.....Covington, Neb.
KATTÉ, WALTER.....Chief Engineer N. Y. Elevated R. R., 35 Broadway,
New York.
McCOMB, DAVID E.....Civil Engineer, P. O. Box 834, Washington, D. C.
MORISON, GEO. S.....52 Wall Street, N. Y.
NICHOLS, O. F.....401 Sackett Street, Brooklyn, N. Y.
NORTH, E. P.....(Care Am. Soc. Civ. Engineers,) 104 East Twentieth
Street, New York.
OPDYKE, STACY B., JR.....45th Street above Butler Street, Pittsburgh, Pa.
PICKETT, W. D.....Bement, Ill.
READ, R. L.....120 Main Street, Cincinnati, O.
SPRONG, CHARLES H.....1046 Wilson Avenue, Cleveland, O.
VAN BUREN, JOHN D.....New Brighton, Staten Island, N. Y.
WEEKS, HARVEY R.....Butlerville, Ind.
WURTELE, ARTHUR S. C....L. S. & M. S. R. R., 192 Franklin Street, Buffalo, N. Y.

JUNIORS.

BROOKS, FREDERICK.....130 Boylston Street, Boston, Mass.
KNIGHT, WILLIAM B.....Panama R. R., Panama, S. A.

ection.

1877.

R. R.,

etween

adway,

. C.

rentieth

, N. Y.